

# SITE QUALITY ASSURANCE PROJECT PLAN

**Cornell-Dubilier Electronics, Inc., Site  
South Plainfield, NJ**

Prepared by:

Removal Support Team 2  
Weston Solutions, Inc.  
Edison, New Jersey 08837

Prepared for:

U.S. Environmental Protection Agency  
Region II - Removal Action Branch  
Edison, New Jersey 08837

DCN #: RST 2-02-F-0400  
TDD #: TO-0007-0115  
EPA Contract No.: EP-W-06-072

**Approved by:**

RST 2

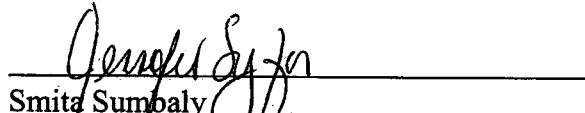


John Brennan

RST 2 Site Project Manager

Date: 12/14/07

RST 2



Smita Sumbaly

RST 2 QA Officer

Date: 12/10/07

EPA

Nicholas Magriples  
On-Scene Coordinator

Date: \_\_\_\_\_

298005



---

## TABLE OF CONTENTS

---

Section	Page
1 INTRODUCTION.....	1
2 PROJECT DESCRIPTION .....	1
3 PROJECT ORGANIZATION AND RESPONSIBILITIES.....	1
4 DATA USE OBJECTIVES, QA OBJECTIVES .....	3
4.1 DATA QA OBJECTIVES .....	3
4.2 QA OBJECTIVES .....	3
5 APPROACH AND SAMPLING PROCEDURES .....	8
5.1 SAMPLING DESIGN.....	8
5.2 SCHEDULE OF ACTIVITIES.....	10
5.3 SAMPLING EQUIPMENT .....	10
5.4 SAMPLE IDENTIFICATION SYSTEM .....	10
5.5 STANDARD OPERATING PROCEDURES (SOPs) .....	11
5.5.1 Sample Documentation .....	11
5.5.2 Sampling SOPs .....	12
5.5.3 Sample Handling and Shipment.....	12
5.6 SAMPLE CONTAINERS.....	12
5.7 DISPOSAL OF PPE AND CONTAMINATED SAMPLING MATERIALS .....	13
6 SAMPLE CUSTODY .....	13
7 FIELD INSTRUMENT CALIBRATION AND PREVENTIVE MAINTENANCE .....	13
8 ANALYTICAL METHODS .....	14
9 DATA REDUCTION, VALIDATION, AND REPORTING .....	14
9.1 DELIVERABLES .....	14
9.2 DATA VALIDATION.....	15
10 FIELD QUALITY CONTROL CHECKS AND FREQUENCY .....	15
11 SYSTEM AUDITS .....	16
12 CORRECTIVE ACTION.....	16

---

## **TABLE OF CONTENTS**

### **(Continued)**

---

The following elements are provided in the RST 2 Generic Quality Assurance Project Plan (QAPP) and are included by reference:

QA REPORTS TO MANAGEMENT

PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES

RECORDS MANAGEMENT SYSTEM

LOGBOOK PROGRAM

QUALITY-RELATED DOCUMENTS

INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

---

## **LIST OF ATTACHMENTS**

---

**ATTACHMENT A:** Site Map

**ATTACHMENT B:** EPA ERT Standard Operating Procedure # 2012 – Soil Sampling  
EPA ERT Standard Operating Procedure # 2016 – Sediment Sampling  
EPA ERT Standard Operating Procedure # 2013 – Surface Water  
Sampling  
EPA ERT Standard Operating Procedure # 2006- Sampling Equipment  
Decontamination

## **1. INTRODUCTION**

Presented herein is the Site Quality Assurance Project Plan (QAPP) for the sampling event to be conducted at the Cornell-Dubilier Electronics, Inc. site by the Region II Removal Support Team 2 (RST 2). The site QAPP has been developed at the request of the United States Environmental Protection Agency (EPA) in accordance with the RST generic Quality Assurance Project Plan (QAPP).

This plan is based on information currently available and may be modified on site in light of field screening results and other acquired information. All deviations from the QAPP will be noted in the Sampling Trip Report.

## **2. PROJECT DESCRIPTION**

The site known as the Cornell-Dubilier Electronics Site is located at 333 Hamilton Blvd, South Plainfield, New Jersey. The site is the location of a former manufacturer of electronic parts and components, including capacitors. Cornell-Dubilier Electronics, Inc., also tested transformer oils. During their operations, the company dumped PCB-contaminated materials and other hazardous substances directly onto the soil at the site. The Site is on the National Priorities List and is being remediated by the EPA Remedial Program and the U.S. Army Corps of Engineers. Currently, the buildings at the Site are being demolished. The Site is approximately 25 acres in size, including an open field and adjoining wetland complex. The Bound Brook traverses the southeast corner of the Site.

In 1997, the Removal Action Branch (RAB) and START collected sediment and soil samples along 2.4 miles of the Bound Brook. In 1999, the floodplain of the Bound Brook was sampled. The purpose of the proposed sampling event is to recreate a portion of the 1997 sampling event to determine if there have been any changes in the PCB concentrations documented in that sampling event. Sediment and water samples will be collected at 50' intervals from forty-four (44) locations along a half-mile stretch of the Bound Brook (Reaches 1-4 from the 1997 sampling event). Sediment samples will be obtained from the center of the stream bed and from 2 locations along the north and south banks of the Bound Brook, approximately 5 feet and 10 feet from the edge of the water (0-6 inch and 18-24 inch depths). Water samples will also be collected from the center of the stream. Including QA/QC samples, there will be a total of approximately 462 sediment and 47 water samples collected from this Site.

## **3. PROJECT ORGANIZATION AND RESPONSIBILITIES**

The EPA On-Scene Coordinator (OSC), Nicholas Magriples will provide overall direction to the staff concerning project sampling needs, objectives, and schedule. The Site Project Manager (SPM), John Brennan, will be the primary point of contact with the OSC. The SPM is responsible for the development and completion of the Sampling QA/QC Plan, project team organization, and supervision of all project tasks, including reporting and deliverables. The Site

QC Coordinator will be responsible for ensuring field adherence to the Sampling QA/QC Plan and recording of any deviations. The RST 2 Chemist/QA/QC Specialist, Smita Sumbaly, will be the primary project team site contact with the subcontracted laboratory, if necessary.

The following sampling personnel will work on this project:

<u>Personnel</u>	<u>Responsibility</u>
Nicholas Magriples	On Scene Coordinator, Sample Location Identification
John Brennen	Site Project Manager, Sample Collection and Sample Management, Site QA/QC, Health and Safety
Matt Foster	Sample Collection
Sandra Richards	Sample Management
Jeffrey Jager	Sample Collection
Kelly Scott	Sample Collection

<u>Lab Name/Location</u>	<u>Sample Type</u>	<u>Parameters</u>
Mitkem 175 Metro Center Blvd Warwick, RI 02886	Sediment, Soil, Water	TCL PCBs
And		
Shealy Environmental Services 106 Vantage Point Drive West Columbia, SC 29172	Sediment, Soil	TCL-PCBs

A three week turnaround for written results has been requested by the OSC.

## **4. DATA USE OBJECTIVES, QA OBJECTIVES**

In addition to the following, the data used objectives, QA objectives procedure will be conducted in accordance with Sections A7, B1, B3, and B4 of the Region II RST 2 QAPP.

The objective of this sampling event is to identify PCB levels along the banks of and within the Bound Brook. The sampling event will focus on a ½ mile stretch of the Bound Brook located adjacent to the Cornell-Dubilier Electronics Site.

### **4.1 DATA QA OBJECTIVES**

The overall quality assurance (QA) objective for chemical measurement data associated with this sampling event is to provide analytical results that are legally defensible in a court of law. The QA program will incorporate quality control (QC) procedures for field sampling, chain-of-custody, laboratory analyses, and reporting to ensure generation of sound analytical results.

The EPA OSC has specified a Level 3 QA objective (formally known as QA Level 2) for this sampling event. Details of this QA level follow.

### **4.2 QA OBJECTIVES**

As delineated in the Uniform Federal Policy for Quality Assurance Project Plans, Part 2B: Quality Assurance/Quality Control Non-Time Critical QA/QC Activities, the following requirements apply to the respective QA objectives and parameters identified.

The QA protocols for a Level 1 (Screening Data, without confirmation) have limited use, specifically for: Emergencies, Health and Safety screening using (e.g. Multi Rae, OVM, Jerome Mercury...etc.). The QA Level 1 objective sampling events are applicable to all sample matrices and include:

1. Sample Documentation (location, date and time collected, batch, etc.)
2. Description of equipment and instrumentation
3. Sample documentation in the form of field logbooks, appropriate field data sheets, and chain-of-custody (when appropriate) records and procedures for field sampling management (e.g., sample location, transport, storage, sample collection methods and shipping procedure)
4. Calibration of all monitoring and/or field-portable analytical equipment prior to collection and analyses of samples with results and/or performance check procedures/methods summarized and documented in a field, personal, and/or instrument log notebook.
5. Analyte(s) identification
6. Field or laboratory determined method detection limits (MDLs) will be recorded along with corresponding analytical sample results, where appropriate.
7. Initial and continuous instrument calibration data.

For QA-2 Objective:

The QA protocols for a Level 2 (screening data with definitive confirmation) QA objective sampling event are applicable to all sample matrices and include:

**All QA level 1 requirements listed above and:**

8. Analytical error determination (Measure the precision of the analytical method, replicate and standard laboratory QC parameters, method-specific requirements specified in the QAPP).
9. Definitive Confirmation (At least 10 percent of the screening data must be confirmed with definitive data)

For QA-3 project:

The QA protocols for a Level 3 (definitive data) QA objective sampling event are applicable to all sample matrices and include:

**All QA level 1 and QA level 2 requirements listed above and:**

10. Collection and analysis of blind field duplicate sample
11. Field blanks (for dedicated and non-dedicated equipment), rinse blanks (for non-dedicated equipment), and
12. Matrix Spike/Matrix Spike Duplicate (MS/MSD) QC samples to provide a



quantitative measure of the analytical precision and accuracy, as applicable.

13. Performance Testing sample (project specified).

Definitive identification - confirm the identification of analytes on 100% of the "critical" samples, via an EPA-approved method; provide documentation such as gas chromatograms, mass spectra, etc.

**Table 1**  
**Quality Assurance Objectives**

QA Parameters	Matrix	Intended Use of Data	QA Objective
PCBs	Sediment, Soil	Verify presence or absence of PCBs	QA-3
PCBs	Aqueous	Verify presence or absence of PCBs	QA-3

A Field Sampling Summary is attached in Table 2 and a QA/QC Analysis and Objectives Summary is attached in Table 3. Subsection 5.1, Sampling Design, provides information on analyses to be performed on the individual soil, sediment, and surface water samples.

**Table 2**  
**Field Sampling Summary**

Analytical Parameters	Matrix	Container Size	Preservative	Holding Time <sup>1</sup>	Subtotal Samples	Field Blanks <sup>3</sup>	Rinsate Blanks <sup>2</sup>	Duplicate Samples <sup>3</sup>	MS/MSD Samples <sup>3</sup>	Total Field Samples
PCBs	Sediment, Soil	8oz Glass Jar	Cool to 4 °C	7 days extraction, 40 days analysis	440	N/A	NR	22	22	462
PCBs	Aqueous	2 – 1 Liter Amber	Cool to 4 °C	7 days extraction, 40 days analysis	44	N/A	NR	3	3	47
PCBs	Aqueous Rinsate	2 – 1 Liter Amber	Cool to 4 °C	7 days extraction, 40 days analysis	10 (1 per day)	N/A	NR	NR	NR	10

<sup>1</sup> Holding time from date of sampling.

<sup>2</sup> Only required if non-dedicated sampling equipment to be used. NR - not required; dedicated sampling equipment to be used.

<sup>3</sup> Not required for QA-1 (screening)

N/A - Not Applicable

*Refer to Attachment B for a list of EPA/ERT SOPs to be used.*

**Table 3**

**QA/QC Analysis and Objectives Summary**

<b>Analytical Parameters</b>	<b>Matrix</b>	<b>Analytical Method Reference</b>	<b>QA/QC Quantitation Limits</b>	<b>QA Objective</b>
PCBs	Sediment, Soil	SW 846 Method 8081	As per method	QA-3
PCBs	Aqueous	EPA Method 608	As per method	QA-3

## **5. APPROACH AND SAMPLING PROCEDURES**

In addition to the following, the approach and sampling procedures will be conducted in accordance with Sections B1 and B4 of the Region II RST 2 QAPP.

The following sampling activities will be conducted at the Cornell-Dubilier Electronics, Inc. site:

- Sediment Sampling
- Soil Sampling
- Surface Water Sampling

This sampling design is based on information currently available and may be modified on-site in light of field-screening results and other acquired information. All deviations from the sampling plan will be noted in the Sampling Trip Report.

### **5.1 SAMPLING DESIGN**

The field program will include the collection of soil, sediment and water samples from in and around the Bound Brook. In accordance with the sampling event conducted by the USEPA in 1997 for this Site, samples will be collected from forty-four (44) transects (Reaches 1-4 from the 1997 sampling event), at 50' intervals, spanning approximately ½ mile of the Bound Brook. Sampling design for each matrix is as follows:

#### **WATER**

Surface water will be collected from the center of the stream at each of the 44 transect locations using 2- 1 Liter Amber jars. RST2 will dip each jar into the water and slowly collect the water from the surface until full. The water samples will be collected before the sediment samples to avoid suspending solids into the water column and possibly the samples. In addition, the water samples will be collected from downstream to upstream to avoid possible cross-contamination from suspended solids. While collecting each sample, the boat and RST 2 personnel will remain downstream of the water being sampled. Water samples will be labeled, cooled to 4°C and stored in plastic coolers for shipment. All samples will be filtered at the laboratory using .45µm filters.

#### **SEDIMENT**

Sediment samples will be collected from the center of the stream bed at each of the 44 transect locations (0-6" and 18-24" depths). Using a stainless steel hand corer equipped with a plastic liner, sediment samples will be obtained from both depths simultaneously. The hand corer will be pushed down through the sediments to 24 inches below grade and pulled up slowly to retrieve samples. Depending on site conditions and sample recovery, the plastic liners may be sealed, stored vertically and maintained on the boat for a brief period. The plastic liner for each sample location will then be sliced open and samples will be separated according to depth. Excessive water will be drained from the plastic liner prior to sample collection. Each sample will be placed directly into 8 oz. glass jars, labeled, cooled to 4°C and stored in plastic coolers for

shipment. A hand corer works by creating a partial vacuum which holds the sample in place and helps prevent washout. As the tube is pulled up, a flutter valve on the head assembly seals the upper end of the sampler. As long as the bottom end of the tube is 2-3" under water, the corer will hold. RST2 will strictly adhere to manufacturers directions to ensure sample integrity.

## SOIL

Soil samples will be collected from four locations at each of the forty-four (44) transects. Two soil samples will be collected from the north bank and two samples will be collected from the south bank of the Bound Brook at approximately 5 feet and 10 feet from the edge of the stream (0-6" and 18-24" depths). Surface samples (0-6") will be collected by hand using new, dedicated plastic scoops and will be transferred directly into new, dedicated aluminum pans. Samples will then be homogenized and placed into 8oz. glass jars. Rocks and other debris will be removed prior to placing the sample into the jar. All samples will be labeled, cooled to 4°C and stored in plastic coolers for shipment.

Following collection of each surface sample, a decontaminated stainless steel auger will be used to advance each borehole to a depth of 18 inches below grade. Subsurface samples (18-24") will then be collected using either decontaminated stainless steel augers or slotted soil recovery probes equipped with 24-inch plastic liners. RST 2 will attempt to use the slotted soil recovery probes first, although the efficiency of the equipment cannot be guaranteed. If the slotted soil recovery probes do not work, then the remaining samples will be collected with decontaminated stainless steel augers. Each sample will be transferred directly into new, dedicated aluminum pans. Samples will then be homogenized and placed into 8oz. glass jars. Rocks and other debris will be removed prior to placing the sample into the jar. All samples will be labeled, cooled to 4°C and stored in plastic coolers for shipment.

## DECONTAMINATION

All non-disposable stainless steel equipment (i.e. scoops, hand augers) involved in field sampling activities will be decontaminated in accordance to EPA/ERT SOP # 2006 before, during and after the sampling event. Following the dry removal of adhering soil to the greatest practical extent, decontamination will be conducted as: (1)- Alconox detergent and potable water scrub. (2) – Potable water rinse, distilled water rinse, (3) Hexane rinse followed by distilled water rinse, (4) Air dry, (5) Cover with new, clean aluminum foil to avoid cross-contamination.

All sampling activities will be performed by the Region II RST 2, under the direction of the EPA OSC.

## **5.2 SCHEDULE OF ACTIVITIES**

<b>Proposed Start Date</b>	<b>Activity</b>	<b>End Date</b>
December 10, 2007	Sediment, Soil, Water Sampling	December 21, 2007

## **5.3 SAMPLING EQUIPMENT**

Soil samples will be collected using new, clean plastic scoops, slotted soil recovery probes equipped with new, clean plastic liners and stainless steel augers. Sediment samples will be collected using a hand corer equipped with dedicated plastic liners. Water samples will be collected directly into amber jars. All non-dedicated sampling equipment including scoops and augers that may be utilized will be decontaminated between uses, in accordance with EPA/ERT SOP #2006 Sampling Equipment Decontamination.

## **5.4 SAMPLE IDENTIFICATION SYSTEM**

Each sample collected by Region II RST 2 will be designated by a code that will identify the sample location. The code for the Cornell-Dubilier Electronics Site is as follows:

### **WATER**

Since only one water sample will be collected at each of the 44 transects, sample ID's will reflect the transect's alphabetic identification followed by the word "water".

### **SEDIMENT**

The first letter designates the transect ID from the 1997 sampling event. The media type label (SED) will differentiate sediment samples from soil samples. The last letter will indicate depth as S (shallow 0-6") and D (deep 18-24"). For example, ASEDs indicates that a sediment sample was obtained from transect A at 0-6".

### **SOIL**

The first letter designates the transect ID from the 1997 sampling event. The bank location of the sample will follow transect ID and be N (north bank) or S (south bank). The next letter will indicate depth as S (shallow 0-6") or D (deep 18-24"). Finally a number symbolizing the distance from the edge of the stream will follow (1 for 5' and 2 for 10'). For example, ANS1 indicates that a soil sample was obtained five feet from the north bank of transect A at 0-6".

Duplicate samples will be identified in the same manner as other samples and will be distinguished and documented in the field logbook.

## **5.5 STANDARD OPERATING PROCEDURES (SOPs)**

### **5.5.1 Sample Documentation**

All sample documents will be completed legibly, in ink. Any corrections or revisions will be made by lining through the incorrect entry and by initialing the error.

#### **Field Logbook**

The field logbook is essentially a descriptive notebook detailing site activities and observations so that an accurate account of field procedures can be reconstructed in the writer's absence. All entries will be dated and signed by the individuals making the entries, and should include (at a minimum) the following:

1. Site name and project number
2. Name(s) of personnel on-site
3. Dates and times of all entries (military time preferred)
4. Descriptions of all site activities, site entry and exit times
5. Noteworthy events and discussions
6. Weather conditions
7. Site observations
8. Sample and sample location identification and description \*
9. Subcontractor information and names of on-site personnel
10. Date and time of sample collections, along with chain of custody information
11. Record of photographs
12. Site sketches

\* The description of the sample location will be noted in such a manner as to allow the reader to reproduce the location in the field at a later date.

#### **Sample Labels**

Sample labels will clearly identify the particular sample, and should include the following:

1. Site/project number.
2. Sample identification number.
3. Sample collection date and time.
4. Designation of sample (grab or composite).
5. Sample preservation.
6. Analytical parameters.
7. Name of sampler.

Sample labels will be written in indelible ink and securely affixed to the sample container. Tie-on labels can be used if properly secured.

#### Custody Seals

Custody seals demonstrate that a sample container has not been tampered with or opened. The individual in possession of the sample(s) will sign and date the seal, affixing it in such a manner that the container cannot be opened without breaking the seal. The name of this individual, along with a description of the sample packaging, will be noted in the field logbook.

### **5.5.2 Sampling SOPs**

The following sampling SOP will be used for this project:

#### Soil Sampling

EPA/ERT SOP #2012, Soil Sampling

#### Sediment Sampling

EPA/ERT SOP #2016, Sediment Sampling

#### Surface Water Sampling

EPA/ERT SOP #2013, Surface Water Sampling

#### Sampling Equipment Decontamination

EPA/ERT SOP #2006, Sampling Equipment Decontamination

### **5.5.3 Sample Handling and Shipment**

Each of the sample bottles will be sealed and labeled according to the following protocol. Caps will be secured with custody seals. Bottle labels will contain all required information including site/project code and sample number, time and date of collection, analyses requested, and preservative used. Sealed bottles will be placed in a plastic cooler, and stored in ice. All packaging will conform to IATA transportation regulations for overnight carriers.

All sample documents will be sealed in a plastic bag and affixed to the underside of each cooler lid. The lid will be sealed and affixed on at least two sides with custody seals so that any sign of tampering is easily visible.

## **5.6 SAMPLE CONTAINERS**

All sample containers will meet the QA/QC specifications in OSWER Directive 9240.0-05A, "Specifications and Guidance for Contaminant Free Sample Containers."



## **5.7 DISPOSAL OF PPE AND CONTAMINATED SAMPLING MATERIALS**

All used PPE and disposable sampling equipment will be void of all gross contamination, double bagged, and properly discarded in the trash receptacle at the RST 2 office.

## **6. SAMPLE CUSTODY**

In addition to the following, the sample custody procedure will be conducted in accordance with Section B2 of the Region II RST 2 QAPP.

A chain-of-custody record will be maintained from the time the sample is taken to its final deposition. Every transfer of custody must be noted and signed for, and a copy of this record kept by each individual who has signed. When samples (or groups of samples) are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a custody seal. Specific information regarding custody of the samples projected to be collected on the weekend will be noted in the field logbook.

The chain-of-custody record should include (at minimum) the following:

1. Sample identification number
2. Sample information
3. Sample location
4. Sample date
5. Name(s) and signature(s) of sampler(s)
6. Signature(s) of any individual(s) with custody of samples

A separate chain-of-custody form must accompany each cooler for each daily shipment. The chain-of-custody form must address all samples in that cooler, but not address samples in any other cooler. This practice maintains the chain-of-custody for all samples in case of mis-shipment.

## **7. FIELD INSTRUMENT CALIBRATION AND PREVENTIVE MAINTENANCE**

In addition to the following, the field instrument and preventative maintenance procedure will be conducted in accordance with Section B5 of the Region II RST 2 QAPP.

The sampling team is responsible for ensuring that a calibration/maintenance log will be brought into the field and maintained for each measuring device. Each log will include at a minimum, where applicable:

- Name of device and/or instrument calibrated.
- Device/instrument serial and/or ID number.
- Frequency of calibration.
- Date of calibration.

- Results of calibration.
- Name of person performing the calibration.
- Identification of the calibrant.

Equipment to be used each day will be calibrated prior to the commencement of daily activities.

## **8. ANALYTICAL METHODS**

Analytical methods to be utilized in the analyses of samples collected during this sampling event are detailed in Table 3.

## **9. DATA REDUCTION, VALIDATION, AND REPORTING**

In addition to the following, the data reduction, validation, and reporting procedure will be conducted in accordance with Section D1 of the Region II RST 2 QAPP.

### **9.1 DELIVERABLES**

The RST 2 SPM, John Brennan, will maintain contact with the EPA OSC, Nicholas Magriples, to keep him informed about the technical and financial progress of this project. Activities under this project will be reported in status and trip reports and other deliverables (e.g., analytical reports, final reports) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and annual reports.

The following deliverables will be provided under this project:

#### Trip Report

A trip report will be prepared to provide a detailed accounting of what occurred during each sampling mobilization. The trip report will be prepared within 2 weeks of the last day of each sampling mobilization. Information will be provided on time of major events, dates, and personnel on-site (including affiliations).

#### Maps/Figures

Maps depicting site layout, contaminant source areas, and sample locations will be included in the trip report, as appropriate.

#### Analytical Report

An analytical report will be prepared for samples analyzed under this plan. Information regarding the analytical methods or procedures employed, sample results, QA/QC results, chain-of-custody documentation, laboratory correspondence, and raw data will be provided within this deliverable.

## Data Review

A review of the data generated under this plan will be undertaken. The assessment of data acceptability or usability will be provided separately, or as part of the analytical report.

## **9.2 DATA VALIDATION**

Data generated under this QA/QC Sampling Plan will be evaluated according to **guidance in the Uniform Federal Policy for Implementing Environmental Quality Systems: Evaluating, Assessing and Documenting Environmental data Collection and Use Programs Part 1: UFP-QAPP (EPA-505-B-04-900A, March 2005); Part 2B: Quality Assurance/Quality Control Compendium: Minimum QA/QC Activities (EPA-505-B-04-900B, March 2005); the CLP National Functional Guidelines for Organic and Inorganic Data Review and the Region 2 Data Validation SOPs:**

Laboratory analytical results will be assessed by the data reviewer for compliance with required precision, accuracy, completeness, representativeness, and sensitivity.

## **10. FIELD QUALITY CONTROL CHECKS AND FREQUENCY**

In addition to the following, the field quality control checks and frequency procedure will be conducted in accordance with Section B6 of the Region II RST 2 QAPP.

Field rinsate blanks will be collected when non-dedicated sampling equipment is used. A field rinsate blank will consist of distilled deionized (DI), demonstrated analyte-free water that has been poured over decontaminated sampling equipment. The field rinsate blank analytical results will be utilized in evaluation of potential cross-contamination resulting from inadequate decontamination only if non-dedicated sampling equipment is used. The frequency of field rinsate blank collection is one blank per decontamination event per type of equipment, not to exceed more than one per day. Blanks will be collected for all parameters of interest (excluding physical parameters) and shipped with the samples collected the same day. Field rinsate blanks will be collected by Region II RST 2.

Field rinsate blanks will be collected in accordance with the procedure listed below:

1. Decontaminate sampling equipment using the procedure specified in Subsection 5.5.2 of this plan.
2. Pour DI water over the sampling device and collect the rinsate in the appropriate sample containers.

One temperature blank sample will be included in each shipped cooler to verify that the samples were maintained at  $4 \pm 2^{\circ}\text{C}$  from the time they were placed in the cooler to their arrival at the laboratory. The temperature blank will be prepared by filling a sample container with unpreserved potable or distilled water. The container will be labeled "Temperature Blank" and dated. The receiving laboratory will establish and record the temperature of the blank on the chain-of-custody form immediately upon receipt, prior to inventory and refrigeration.

## **11. SYSTEM AUDITS**

In addition to the following, the system audit procedure will be conducted in accordance with Section C1 of the Region II RST 2 QAPP.

The Field QA/QC Officer will observe sampling operations and review subsequent analytical results to ensure compliance with the QA/QC requirements of the project/sampling event.

## **12. CORRECTIVE ACTION**

In addition to the following, the corrective action procedure will be conducted in accordance with Section C1 of the Region II RST 2 QAPP.

All provisions will be taken in the field and laboratory to ensure that any problems that may develop will be dealt with as quickly as possible to ensure the continuity of the project/sampling events. Any deviations from this sampling plan will be noted in the final report.

---

**ATTACHMENT A**

**SITE MAP**

---





SAMPLE LOCATION	LONGITUDE	LATITUDE
1	-74.40911	40.57355
2	-74.40927	40.57361
3	-74.40939	40.57371
4	-74.40939	40.57383
5	-74.40933	40.57396
6	-74.40927	40.57409
7	-74.40929	40.57422
8	-74.40931	40.57436
9	-74.40936	40.57449
10	-74.40946	40.57460
11	-74.40959	40.57470
12	-74.40971	40.57480
13	-74.40983	40.57490
14	-74.40989	40.57530
15	-74.40989	40.57543
16	-74.40989	40.57557
17	-74.40997	40.57569
18	-74.41009	40.57579
19	-74.41025	40.57585
20	-74.41041	40.57591
21	-74.41050	40.57601
22	-74.41053	40.57615
23	-74.41061	40.57627
24	-74.41076	40.57693
25	-74.41077	40.57706
26	-74.41082	40.57719
27	-74.41089	40.57732
28	-74.41096	40.57745
29	-74.41104	40.57757
30	-74.41114	40.57768
31	-74.41124	40.57780
32	-74.41134	40.57791
33	-74.41150	40.57816
34	-74.41162	40.57826
35	-74.41175	40.57835
36	-74.41189	40.57844
37	-74.41202	40.57854
38	-74.41215	40.57863
39	-74.41247	40.57873
40	-74.41265	40.57874
41	-74.41283	40.57873
42	-74.41300	40.57869
43	-74.41316	40.57861
44	-74.41333	40.57858



---

**ATTACHMENT B**

**EPA/ERT SAMPLING STANDARD OPERATING PROCEDURES**

---



# U. S. EPA ENVIRONMENTAL RESPONSE TEAM

## STANDARD OPERATING PROCEDURES

SOP: 2012  
PAGE: 1 of 13  
REV: 0.0  
DATE: 02/18/00

### SOIL SAMPLING

---

#### CONTENTS

- 1.0 SCOPE AND APPLICATION
- 2.0 METHOD SUMMARY
- 3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE
- 4.0 POTENTIAL PROBLEMS
- 5.0 EQUIPMENT
- 6.0 REAGENTS
- 7.0 PROCEDURES
  - 7.1 Preparation
  - 7.2 Sample Collection
    - 7.2.1 Surface Soil Samples
    - 7.2.2 Sampling at Depth with Augers and Thin Wall Tube Samplers
    - 7.2.3 Sampling at Depth with a Trier
    - 7.2.4 Sampling at Depth with a Split Spoon (Barrel) Sampler
    - 7.2.5 Test Pit/Trench Excavation
- 8.0 CALCULATIONS
- 9.0 QUALITY ASSURANCE/QUALITY CONTROL
- 10.0 DATA VALIDATION
- 11.0 HEALTH AND SAFETY
- 12.0 REFERENCES
- 13.0 APPENDIX
  - Figures

SUPERCEDES: SOP #2012; Revision 0.0; 11/16/94; U.S. EPA Contract 68-C4-0022.





# U. S. EPA ENVIRONMENTAL RESPONSE TEAM

## STANDARD OPERATING PROCEDURES

SOP: 2012  
PAGE: 2 of 13  
REV: 0.0  
DATE: 02/18/00

### SOIL SAMPLING

---

#### 1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to describe the procedures for the collection of representative soil samples. Sampling depths are assumed to be those that can be reached without the use of a drill rig, direct-push, or other mechanized equipment (except for a back-hoe). Analysis of soil samples may determine whether concentrations of specific pollutants exceed established action levels, or if the concentrations of pollutants present a risk to public health, welfare, or the environment.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the actual procedures used should be documented and described in an appropriate site report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (EPA) endorsement or recommendation for use.

#### 2.0 METHOD SUMMARY

Soil samples may be collected using a variety of methods and equipment depending on the depth of the desired sample, the type of sample required (disturbed vs. undisturbed), and the soil type. Near-surface soils may be easily sampled using a spade, trowel, and scoop. Sampling at greater depths may be performed using a hand auger, continuous flight auger, a trier, a split-spoon, or, if required, a backhoe.

#### 3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Chemical preservation of solids is not generally recommended. Samples should, however, be cooled and protected from sunlight to minimize any potential reaction. The amount of sample to be collected and proper sample container type are discussed in ERT/REAC SOP #2003 Rev. 0.0 08/11/94, *Sample Storage, Preservation and Handling*.

#### 4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary potential problems associated with soil sampling - cross contamination of samples and improper sample collection. Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment, disturbance of the matrix resulting in compaction of the sample, or inadequate homogenization of the samples where required, resulting in variable, non-representative results.

#### 5.0 EQUIPMENT



# U. S. EPA ENVIRONMENTAL RESPONSE TEAM

## STANDARD OPERATING PROCEDURES

SOP: 2012  
PAGE: 3 of 13  
REV: 0.0  
DATE: 02/18/00

### SOIL SAMPLING

---

Soil sampling equipment includes the following:

- ☐ Maps/plot plan
- ☐ Safety equipment, as specified in the site-specific Health and Safety Plan
- ☐ Survey equipment or global positioning system (GPS) to locate sampling points
- ☐ Tape measure
- ☐ Survey stakes or flags
- ☐ Camera and film
- ☐ Stainless steel, plastic, or other appropriate homogenization bucket, bowl or pan
- ☐ Appropriate size sample containers
- ☐ Ziplock plastic bags
- ☐ Logbook
- ☐ Labels
- ☐ Chain of Custody records and custody seals
- ☐ Field data sheets and sample labels
- ☐ Cooler(s)
- ☐ Ice
- ☐ Vermiculite
- ☐ Decontamination supplies/equipment
- ☐ Canvas or plastic sheet
- ☐ Spade or shovel
- ☐ Spatula
- ☐ Scoop
- ☐ Plastic or stainless steel spoons
- ☐ Trowel(s)
- ☐ Continuous flight (screw) auger
- ☐ Bucket auger
- ☐ Post hole auger
- ☐ Extension rods
- ☐ T-handle
- ☐ Sampling trier
- ☐ Thin wall tube sampler
- ☐ Split spoons
- ☐ Vehimeyer soil sampler outfit
  - Tubes
  - Points
  - Drive head
  - Drop hammer
  - Puller jack and grip
- ☐ Backhoe

#### 6.0 REAGENTS



# U. S. EPA ENVIRONMENTAL RESPONSE TEAM

## STANDARD OPERATING PROCEDURES

SOP: 2012  
PAGE: 4 of 13  
REV: 0.0  
DATE: 02/18/00

### SOIL SAMPLING

---

Reagents are not used for the preservation of soil samples. Decontamination solutions are specified in ERT/REAC SOP #2006 Rev. 0.0 08/11/94, *Sampling Equipment Decontamination*, and the site specific work plan.

#### 7.0 PROCEDURES

##### 7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies required.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or pre-clean equipment, and ensure that it is in working order.
4. Prepare schedules and coordinate with staff, client, and regulatory agencies, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.
6. Use stakes, flagging, or buoys to identify and mark all sampling locations. Specific site factors, including extent and nature of contaminant, should be considered when selecting sample location. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations should be utility-cleared by the property owner or the On-Scene-Coordinator (OSC) prior to soil sampling; and utility clearance should always be confirmed before beginning work.

##### 7.2 Sample Collection

###### 7.2.1 Surface Soil Samples

Collection of samples from near-surface soil can be accomplished with tools such as spades, shovels, trowels, and scoops. Surface material is removed to the required depth and a stainless steel or plastic scoop is then used to collect the sample.

This method can be used in most soil types but is limited to sampling at or near the ground surface. Accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the sample team member. A flat, pointed mason trowel to cut a block of the desired soil is helpful when undisturbed profiles are required. Tools plated with chrome or other materials should not be used. Plating is particularly common with garden implements such as potting trowels.

The following procedure is used to collect surface soil samples:



# U. S. EPA ENVIRONMENTAL RESPONSE TEAM

## STANDARD OPERATING PROCEDURES

SOP: 2012  
PAGE: 5 of 13  
REV: 0.0  
DATE: 02/18/00

### SOIL SAMPLING

---

1. Carefully remove the top layer of soil or debris to the desired sample depth with a pre-cleaned spade.
2. Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard a thin layer of soil from the area which came in contact with the spade.
3. If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

#### 7.2.2 Sampling at Depth with Augers and Thin Wall Tube Samplers

This system consists of an auger, or a thin-wall tube sampler, a series of extensions, and a "T" handle (Figure 1, Appendix A). The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger. If a core sample is to be collected, the auger tip is then replaced with a thin wall tube sampler. The system is then lowered down the borehole, and driven into the soil to the completion depth. The system is withdrawn and the core is collected from the thin wall tube sampler.

Several types of augers are available; these include: bucket type, continuous flight (screw), and post-hole augers. Bucket type augers are better for direct sample recovery because they provide a large volume of sample in a short time. When continuous flight augers are used, the sample can be collected directly from the flights. The continuous flight augers are satisfactory when a composite of the complete soil column is desired. Post-hole augers have limited utility for sample collection as they are designed to cut through fibrous, rooted, swampy soil and cannot be used below a depth of approximately three feet.

The following procedure is used for collecting soil samples with the auger:

1. Attach the auger bit to a drill rod extension, and attach the "T" handle to the drill rod.



# U. S. EPA ENVIRONMENTAL RESPONSE TEAM

## STANDARD OPERATING PROCEDURES

SOP: 2012  
PAGE: 6 of 13  
REV: 0.0  
DATE: 02/18/00

### SOIL SAMPLING

---

2. Clear the area to be sampled of any surface debris (e.g., twigs, rocks, litter). It may be advisable to remove the first three to six inches of surface soil for an area approximately six inches in radius around the drilling location.
3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding drill rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.
4. After reaching the desired depth, slowly and carefully remove the auger from the hole. When sampling directly from the auger, collect the sample after the auger is removed from the hole and proceed to Step 10.
5. Remove auger tip from the extension rods and replace with a pre-cleaned thin wall tube sampler. Install the proper cutting tip.
6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into the soil. Do not scrape the borehole sides. Avoid hammering the rods as the vibrations may cause the boring walls to collapse.
7. Remove the tube sampler, and unscrew the drill rods.
8. Remove the cutting tip and the core from the device.
9. Discard the top of the core (approximately 1 inch), as this possibly represents material collected before penetration of the layer of concern. Place the remaining core into the appropriate labeled sample container. Sample homogenization is not required.
10. If volatile organic analysis is to be performed, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly.

When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.



# U. S. EPA ENVIRONMENTAL RESPONSE TEAM

## STANDARD OPERATING PROCEDURES

SOP: 2012  
PAGE: 7 of 13  
REV: 0.0  
DATE: 02/18/00

### SOIL SAMPLING

---

11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger bit to the drill and assembly, and follow steps 3 through 11, making sure to decontaminate the auger and tube sampler between samples.
12. Abandon the hole according to applicable state regulations. Generally, shallow holes can simply be backfilled with the removed soil material.

#### 7.2.3 Sampling with a Trier

The system consists of a trier, and a "T" handle. The auger is driven into the soil to be sampled and used to extract a core sample from the appropriate depth.

The following procedure is used to collect soil samples with a sampling trier:

1. Insert the trier (Figure 2, Appendix A) into the material to be sampled at a 0° to 45° angle from horizontal. This orientation minimizes the spillage of sample.
2. Rotate the trier once or twice to cut a core of material.
3. Slowly withdraw the trier, making sure that the slot is facing upward.
4. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

#### 7.2.4 Sampling at Depth with a Split Spoon (Barrel) Sampler

Split spoon sampling is generally used to collect undisturbed soil cores of 18 or 24 inches in length. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted.

When split spoon sampling is performed to gain geologic information, all work should



# U. S. EPA ENVIRONMENTAL RESPONSE TEAM

## STANDARD OPERATING PROCEDURES

SOP: 2012  
PAGE: 8 of 13  
REV: 0.0  
DATE: 02/18/00

### SOIL SAMPLING

---

be performed in accordance with ASTM D1586-98, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils".

The following procedures are used for collecting soil samples with a split spoon:

1. Assemble the sampler by aligning both sides of barrel and then screwing the drive shoe on the bottom and the head piece on top.
2. Place the sampler in a perpendicular position on the sample material.
3. Using a well ring, drive the tube. Do not drive past the bottom of the head piece or compression of the sample will result.
4. Record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain this depth.
5. Withdraw the sampler, and open by unscrewing the bit and head and splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally. This sampler is typically available in 2 and 3 1/2 inch diameters. A larger barrel may be necessary to obtain the required sample volume.
6. Without disturbing the core, transfer it to appropriate labeled sample container(s) and seal tightly.

#### 7.2.5 Test Pit/Trench Excavation

A backhoe can be used to remove sections of soil, when detailed examination of soil characteristics are required. This is probably the most expensive sampling method because of the relatively high cost of backhoe operation.

The following procedures are used for collecting soil samples from test pits or trenches:

1. Prior to any excavation with a backhoe, it is important to ensure that all sampling locations are clear of overhead and buried utilities.
2. Review the site specific Health & Safety plan and ensure that all safety precautions including appropriate monitoring equipment are installed as required.



# U. S. EPA ENVIRONMENTAL RESPONSE TEAM

## STANDARD OPERATING PROCEDURES

SOP: 2012  
PAGE: 9 of 13  
REV: 0.0  
DATE: 02/18/00

### SOIL SAMPLING

---

3. Using the backhoe, excavate a trench approximately three feet wide and approximately one foot deep below the cleared sampling location. Place excavated soils on plastic sheets. Trenches greater than five feet deep must be sloped or protected by a shoring system, as required by OSHA regulations.
4. A shovel is used to remove a one to two inch layer of soil from the vertical face of the pit where sampling is to be done.
5. Samples are taken using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.
6. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.
7. Abandon the pit or excavation according to applicable state regulations. Generally, shallow excavations can simply be backfilled with the removed soil material.

#### 8.0 CALCULATIONS

This section is not applicable to this SOP.

#### 9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration





# U. S. EPA ENVIRONMENTAL RESPONSE TEAM

## STANDARD OPERATING PROCEDURES

SOP: 2012  
PAGE: 10 of 13  
REV: 0.0  
DATE: 02/18/00

### SOIL SAMPLING

---

activities must occur prior to sampling/operation, and they must be documented.

#### 10.0 DATA VALIDATION

This section is not applicable to this SOP.

#### 11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and corporate health and safety procedures, in addition to the procedures specified in the site specific Health & Safety Plan..

#### 12.0 REFERENCES

Mason, B.J. 1983. Preparation of Soil Sampling Protocol: Technique and Strategies. EPA-600/4-83-020.

Barth, D.S. and B.J. Mason. 1984. Soil Sampling Quality Assurance User's Guide. EPA-600/4-84-043..

U.S. Environmental Protection Agency. 1984 Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition. EPA-600/4-84-076.

de Vera, E.R., B.P. Simmons, R.D. Stephen, and D.L. Storm. 1980. Samplers and Sampling Procedures for Hazardous Waste Streams. EPA-600/2-80-018.

ASTM D 1586-98, ASTM Committee on Standards, Philadelphia, PA.



# U. S. EPA ENVIRONMENTAL RESPONSE TEAM

## STANDARD OPERATING PROCEDURES

SOP: 2012  
PAGE: 11 of 13  
REV: 0.0  
DATE: 02/18/00

### SOIL SAMPLING

---

APPENDIX A  
Figures  
SOP #2012  
February 2000



# U. S. EPA ENVIRONMENTAL RESPONSE TEAM

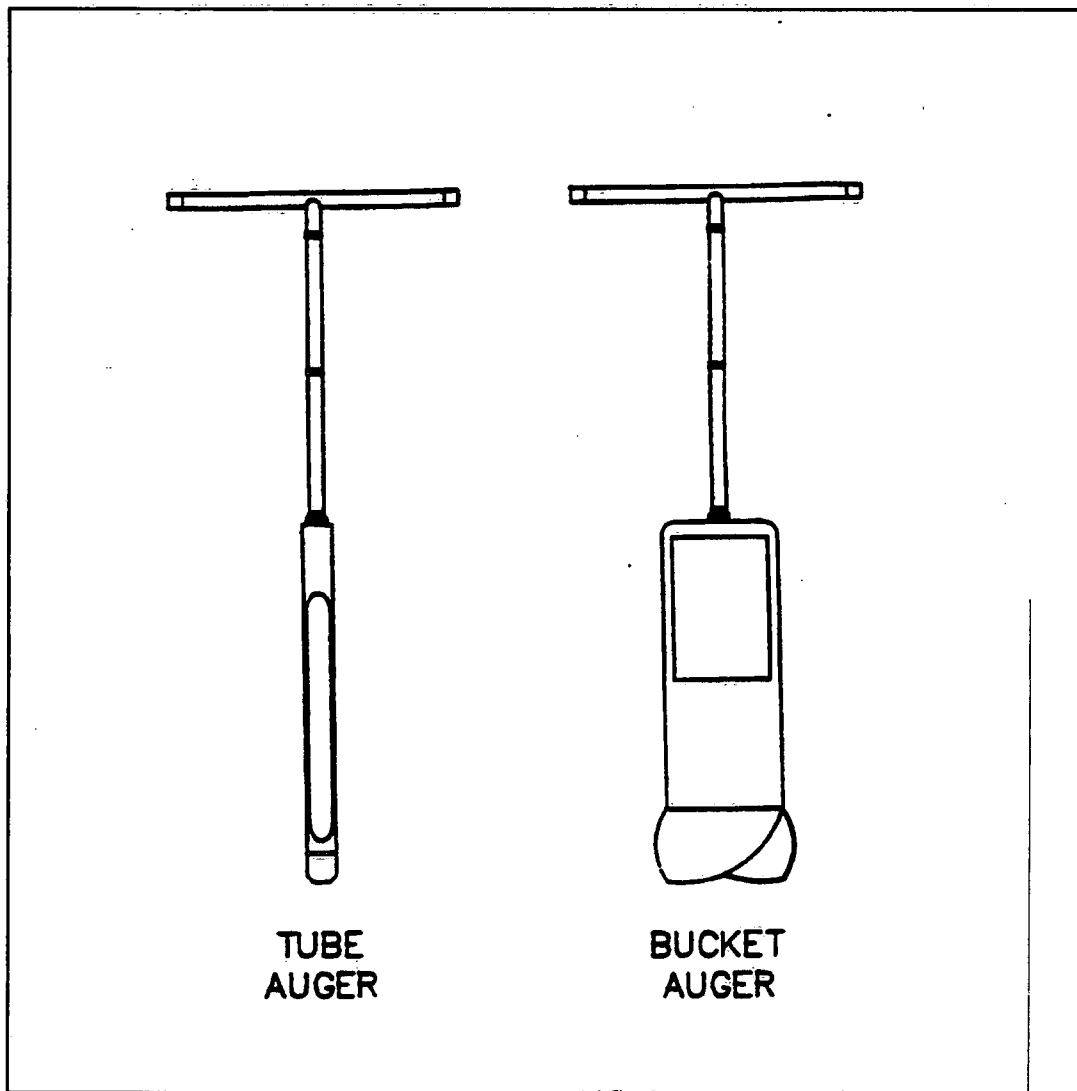
## STANDARD OPERATING PROCEDURES

SOP: 2012  
PAGE: 12 of 13  
REV: 0.0  
DATE: 02/18/00

### SOIL SAMPLING

---

FIGURE 1. Sampling Augers





# U. S. EPA ENVIRONMENTAL RESPONSE TEAM

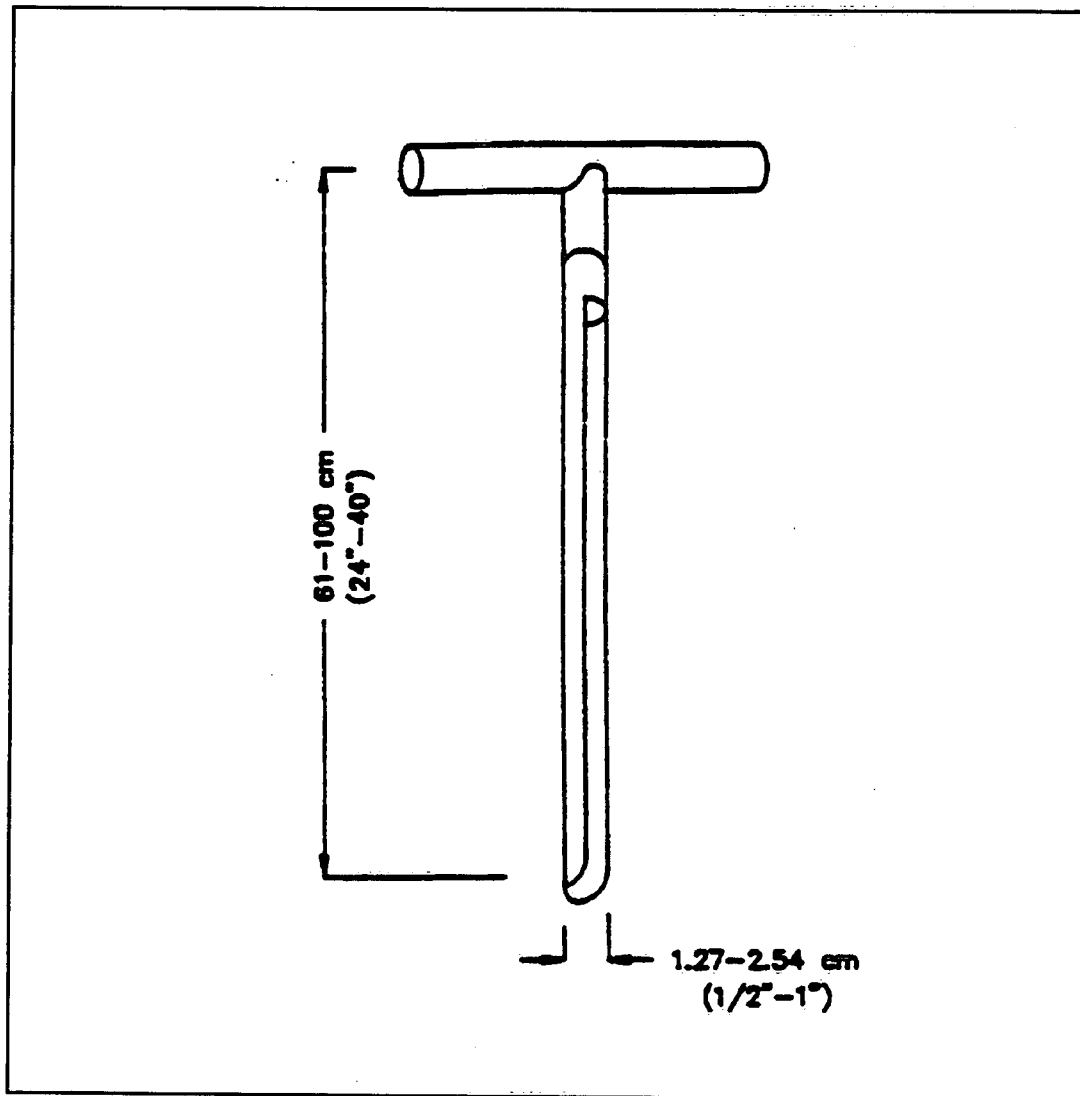
## STANDARD OPERATING PROCEDURES

SOP: 2012  
PAGE: 13 of 13  
REV: 0.0  
DATE: 02/18/00

### SOIL SAMPLING

---

FIGURE 2. Sampling Trier





## SEDIMENT SAMPLING

SOP#: 2016  
DATE: 11/17/94  
REV. #: 0.0

### 1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) is applicable to the collection of representative sediment samples. Analysis of sediment may be biological, chemical, or physical in nature and may be used to determine the following:

- C toxicity;
- C biological availability and effects of contaminants;
- C benthic biota;
- C extent and magnitude of contamination;
- C contaminant migration pathways and source;
- C fate of contaminants;
- C grain size distribution.

The methodologies discussed in this SOP are applicable to the sampling of sediment in both flowing and standing water. They are generic in nature and may be modified in whole or part to meet the handling and analytical requirements of the contaminants of concern, as well as the constraints presented by site conditions and equipment limitations. However, if modifications occur, they should be documented in a site or personal logbook and discussed in reports summarizing field activities and analytical results.

For the purposes of this procedure, sediments are those mineral and organic materials situated beneath an aqueous layer. The aqueous layer may be either static, as in lakes, ponds, and impoundments; or flowing, as in rivers and streams.

Mention of trade names or commercial products does not constitute U.S. EPA endorsement or recommendation for use.

### 2.0 METHOD SUMMARY

Sediment samples may be collected using a variety of methods and equipment, depending on the depth of the aqueous layer, the portion of the sediment profile

required (surface vs. subsurface), the type of sample required (disturbed vs. undisturbed), contaminants present, and sediment type.

Sediment is collected from beneath an aqueous layer either directly, using a hand held device such as a shovel, trowel, or auger; or indirectly, using a remotely activated device such as an Ekman or Ponar dredge. Following collection, sediment is transferred from the sampling device to a sample container of appropriate size and construction for the analyses requested. If composite sampling techniques are employed, multiple grabs are placed into a container constructed of inert material, homogenized, and transferred to sample containers appropriate for the analyses requested. The homogenization procedure should not be used if sample analysis includes volatile organics; in this case, sediment, or multiple grabs of sediment, should be transferred directly from the sample collection device or homogenization container to the sample container.

### 3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

1. Chemical preservation of solids is generally not recommended. Cooling to 4°C is usually the best approach, supplemented by the appropriate holding time for the analyses requested.
2. Wide mouth glass containers with Teflon lined caps are utilized for sediment samples. The sample volume is a function of the analytical requirements and will be specified in the Work Plan.
3. If analysis of sediment from a discrete depth or location is desired, sediment is transferred directly from the sampling device to a labeled sample container(s) of appropriate size and construction for the analyses

requested. Transfer is accomplished with a stainless steel or plastic lab spoon or equivalent.

4. If composite sampling techniques or multiple grabs are employed, equal portions of sediment from each location are deposited into a stainless steel, plastic, or other appropriate composition (e.g., Teflon) containers. The sediment is homogenized thoroughly to obtain a composite representative of the area sampled. The composite sediment sample is transferred to a labeled container(s) of appropriate size and construction for the analyses requested. Transfer of sediment is accomplished with a stainless steel or plastic lab spoon or equivalent. Samples for volatile organic analysis must be transferred directly from the sample collection device or pooled from multiple areas in the homogenization container prior to mixing. This is done to minimize loss of contaminant due to volatilization during homogenization.
5. All sampling devices should be decontaminated, then wrapped in aluminum foil. The sampling device should remain in this wrapping until it is needed. Each sampling device should be used for only one sample. Disposable sampling devices for sediment are generally impractical due to cost and the large number of sediment samples which may be required. Sampling devices should be cleaned in the field using the decontamination procedure described in the Sampling Equipment Decontamination SOP.

#### **4.0 INTERFERENCES AND POTENTIAL PROBLEMS**

Substrate particle size and organic matter content are a direct consequence of the flow characteristics of a waterbody. Contaminants are more likely to be concentrated in sediments typified by fine particle size and a high organic matter content. This type of sediment is most likely to be collected from depositional zones. In contrast, coarse sediments with low organic matter content do not typically concentrate pollutants and are generally found in erosional zones. The selection of a sampling location

can, therefore, greatly influence the analytical results and should be justified and specified in the Work Plan.

#### **5.0 EQUIPMENT/APPARATUS**

Equipment needed for collection of sediment samples may include:

- C Maps/plot plan
- C Safety equipment
- C Compass
- C Tape measure
- C Survey stakes, flags, or buoys and anchors
- C Camera and film
- C Stainless steel, plastic, or other appropriate composition bucket
- C 4-oz., 8-oz., and one-quart wide mouth jars w/Teflon lined lids
- C Ziploc plastic bags
- C Logbook
- C Sample jar labels
- C Chain of Custody records, field data sheets
- C Cooler(s)
- C Ice
- C Decontamination supplies/equipment
- C Spade or shovel
- C Spatula
- C Scoop
- C Trowel
- C Bucket auger
- C Tube auger
- C Extension rods
- C "T" handle
- C Sediment coring device (tube, drive head, eggshell check valve, nosecone, acetate tube, extension rods, "T" handle)
- C Ponar dredge
- C Ekman dredge
- C Nylon rope or steel cable
- C Messenger device

#### **6.0 REAGENTS**

Reagents are not used for preservation of sediment samples. Decontamination solutions are specified in the Sampling Equipment Decontamination SOP.

## **7.0 PROCEDURES**

### **7.1 Preparation**

1. Determine the objective(s) and extent of the sampling effort. The sampling methods to be employed, and the types and amounts of equipment and supplies required will be a function of site characteristics and objectives of the study.
2. Obtain the necessary sampling and monitoring equipment.
3. Prepare schedules, and coordinate with staff, client, and regulatory agencies, if appropriate.
4. Decontaminate or preclean equipment, and ensure that it is in working order.
5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.
6. Use stakes, flagging, or buoys to identify and mark all sampling locations. Specific site factors including flow regime, basin morphometry, sediment characteristics, depth of overlying aqueous layer, contaminant source, and extent and nature of contamination should be considered when selecting sample locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

### **7.2 Sample Collection**

Selection of a sampling device is most often contingent upon: (1) the depth of water at the sampling location, and (2) the physical characteristics of the sediment to be sampled. The following procedures may be utilized:

#### **7.2.1 Sampling Surface Sediment with a Trowel or Scoop from Beneath a Shallow Aqueous Layer**

For the purpose of this method, surface sediment is considered to range from 0 to six inches in depth and

a shallow aqueous layer is considered to range from 0 to 12 inches in depth. Collection of surface sediment from beneath a shallow aqueous layer can be accomplished with tools such as spades, shovels, trowels, and scoops. Although this method can be used to collect both unconsolidated/consolidated sediment, it is limited somewhat by the depth and movement of the aqueous layer. Deep and rapidly flowing water render this method less accurate than others discussed below. However, representative samples can be collected with this procedure in shallow sluggish water provided care is demonstrated by the sample team member. A stainless steel or plastic sampling implement will suffice in most applications. Care should be exercised to avoid the use of devices plated with chrome or other materials; plating is particularly common with garden trowels.

The following procedure will be used to collect sediment with a scoop, shovel, or trowel:

1. Using a decontaminated sampling implement, remove the desired thickness and volume of sediment from the sampling area.
2. Transfer the sample into an appropriate sample or homogenization container. Ensure that non-dedicated containers have been adequately decontaminated.
3. Surface water should be decanted from the sample or homogenization container prior to sealing or transfer; care should be taken to retain the fine sediment fraction during this procedure.

#### **7.2.2 Sampling Surface Sediment with a Bucket Auger or Tube Auger from Beneath a Shallow Aqueous Layer**

For the purpose of this method, surface sediment is considered to range from 0 to six inches in depth and a shallow aqueous layer is considered to range from 0 to 24 inches in depth. Collection of surface sediment from beneath a shallow aqueous layer can be accomplished with a system consisting of bucket auger or tube auger, a series of extensions, and a "T" handle (Figure 1, Appendix A). The use of additional extensions in conjunction with a bucket auger can increase the depth of water from which sediment can be collected from 24 inches to 10 feet or more. However, sample handling and manipulation increases

in difficulty with increasing depth of water. The bucket auger or tube auger is driven into the sediment and used to extract a core. The various depths represented by the core are homogenized or a subsample of the core is taken from the appropriate depth.

The following procedure will be used to collect sediment samples with a bucket auger or tube auger:

1. An acetate core may be inserted into the bucket auger or tube auger prior to sampling if characteristics of the sediments or waterbody warrant. By using this technique, an intact core can be extracted.
2. Attach the auger head to the required length of extensions, then attach the "T" handle to the upper extension.
3. Clear the area to be sampled of any surface debris.
4. Insert the bucket auger or tube auger into the sediment at a 0° to 20° angle from vertical. This orientation minimizes spillage of the sample from the sampler upon extraction from the sediment and water.
5. Rotate the auger to cut a core of sediment.
6. Slowly withdraw the auger; if using a tube auger, make sure that the slot is facing upward.
7. Transfer the sample or a specified aliquot of sample into an appropriate sample or homogenization container. Ensure that non-dedicated containers have been adequately decontaminated.

### 7.2.3 Sampling Deep Sediment with a Bucket Auger or Tube Auger from Beneath a Shallow Aqueous Layer

For the purpose of this method, deep sediment is considered to range from six to greater than 18 inches in depth and a shallow aqueous layer is considered to range from 0 to 24 inches. Collection of deep sediment from beneath a shallow aqueous layer can be accomplished with a system consisting of a bucket auger, a tube auger, a series of extensions and a

"T" handle. The use of additional extensions can increase the depth of water from which sediment can be collected from 24 inches to five feet or more. However, water clarity must be high enough to permit the sampler to directly observe the sampling operation. In addition, sample handling and manipulation increases in difficulty with increasing depth of water. The bucket auger is used to bore a hole to the upper range of the desired sampling depth and then withdrawn. The tube auger is then lowered down the borehole, and driven into the sediment to the lower range of the desired sampling depth. The tube is then withdrawn and the sample recovered from the tube. This method can be used to collect firmly consolidated sediments, but is somewhat limited by the depth of the aqueous layer, and the integrity of the initial borehole.

The following procedure will be used to collect deep sediment samples with a bucket auger and a tube auger:

1. Attach the bucket auger bit to the required lengths of extensions, then attach the "T" handle to the upper extension.
2. Clear the area to be sampled of any surface debris.
3. Begin augering, periodically removing any accumulated sediment (i.e., cuttings) from the auger bucket. Cuttings should be disposed of far enough from the sampling area to minimize cross contamination of various depths.
4. After reaching the upper range of the desired depth, slowly and carefully remove bucket auger from the boring.
5. Attach the tube auger bit to the required lengths of extensions, then attach the "T" handle to the upper extension.
6. Carefully lower tube auger down borehole using care to avoid making contact with the borehole sides and, thus, cross contaminating the sample. Gradually force tube auger into sediment to the lower range of the desired sampling depth. Hammering of the tube auger to facilitate coring should be avoided as the vibrations may cause the boring walls



to collapse.

7. Remove tube auger from the borehole, again taking care to avoid making contact with the borehole sides and, thus, cross contaminating the sample.
8. Discard the top of core (approximately 1 inch); as this represents material collected by the tube auger before penetration to the layer of concern.
9. Transfer sample into an appropriate sample or homogenization container. Ensure that non-dedicated containers have been adequately decontaminated.

#### 7.2.4 Sampling Surface Sediment with an Ekman or Ponar Dredge from Beneath a Shallow or Deep Aqueous Layer

For the purpose of this method, surface sediment is considered to range from 0 to six inches in depth. Collection of surface sediment can be accomplished with a system consisting of a remotely activated device (dredge) and a deployment system. This technique consists of lowering a sampling device (dredge) to the surface of the sediment by use of a rope, cable, or extended handle. The mechanism is activated, and the device entraps sediment in spring loaded or lever operated jaws.

An Ekman dredge is a lightweight sediment sampling device with spring activated jaws. It is used to collect moderately consolidated, fine textured sediment. The following procedure will be used for collecting sediment with an Ekman dredge (Figure 2, Appendix A):

1. Attach a sturdy nylon rope or stainless steel cable through the hole on the top of the bracket, or secure the extension handle to the bracket with machine bolts.
2. Attach springs to both sides of the jaws. Fix the jaws so that they are in open position by placing trip cables over the release studs. Ensure that the hinged doors on the dredge top are free to open.
3. Lower the sampler to a point 4 to 6 inches

above the sediment surface.

4. Drop the sampler to the sediment.
5. Trigger the jaw release mechanism by lowering a messenger down the line, or by depressing the button on the upper end of the extension handle.
6. Raise the sampler and slowly decant any free liquid through the top of the sampler. Care should be taken to retain the fine sediment fraction during this procedure.
7. Open the dredge jaws and transfer the sample into a stainless steel, plastic or other appropriate composition (e.g., Teflon) container. Ensure that non-dedicated containers have been adequately decontaminated. If necessary, continue to collect additional sediment grabs until sufficient material has been secured to fulfill analytical requirements. Thoroughly homogenize and then transfer sediment to sample containers appropriate for the analyses requested. Samples for volatile organic analysis must be collected directly from the bucket before homogenization to minimize volatilization of contaminants.

A Ponar dredge is a heavyweight sediment sampling device with weighted jaws that are lever or spring activated. It is used to collect consolidated fine to coarse textured sediment. The following procedure will be used for collecting sediment with a Ponar dredge (Figure 3, Appendix A):

1. Attach a sturdy nylon rope or steel cable to the ring provided on top of the dredge.
2. Arrange the Ponar dredge with the jaws in the open position, setting the trip bar so the sampler remains open when lifted from the top. If the dredge is so equipped, place the spring loaded pin into the aligned holes in the trip bar.
3. Slowly lower the sampler to a point approximately two inches above the sediment.
4. Drop the sampler to the sediment. Slack on

the line will release the trip bar or spring loaded pin; pull up sharply on the line closing the dredge.

5. Raise the dredge to the surface and slowly decant any free liquid through the screens on top of the dredge. Care should be taken to retain the fine sediment fraction during this operation.
6. Open the dredge and transfer the sediment to a stainless steel, plastic or other appropriate composition (e.g., Teflon) container. Ensure that non-dedicated containers have been adequately decontaminated. If necessary, continue to collect additional sediment until sufficient material has been secured to fulfill analytical requirements. Thoroughly homogenized and then transfer sediment to sample containers appropriate for the analyses requested. Samples for volatile organic analysis must be collected directly from the bucket before homogenization to minimize volatilization of contaminants.

#### 7.2.5 Sampling Subsurface Sediment with a Coring Device from Beneath a Shallow Aqueous Layer

For purposes of this method, subsurface sediment is considered to range from 6 to 24 inches in depth and a shallow aqueous layer is considered to range from 0 to 24 inches in depth. Collection of subsurface sediment from beneath a shallow aqueous layer can be accomplished with a system consisting of a tube sampler, acetate tube, eggshell check valve, nosecone, extensions, and "T" handle, or drivehead. The use of additional extensions can increase the depth of water from which sediment can be collected from 24 inches to 10 feet or more. This sampler may be used with either a drive hammer for firm sediment, or a "T" handle for soft sediment. However, sample handling and manipulation increases in difficulty with increasing depth of water.

The following procedure describes the use of a sample coring device (Figure 4, Appendix A) used to collect subsurface sediments.

1. Assemble the coring device by inserting the acetate core into the sampling tube.
2. Insert the "egg shell" check valve into the lower end of the sampling tube with the convex surface positioned inside the acetate core.
3. Screw the nosecone onto the lower end of the sampling tube, securing the acetate tube and eggshell check valve.
4. Screw the handle onto the upper end of the sampling tube and add extension rods as needed.
5. Place the sampler in a perpendicular position on the sediment to be sampled.
6. If the "T" handle is used, place downward pressure on the device until the desired depth is reached. After the desired depth is reached, rotate the sampler to shear off the core at the bottom. Slowly withdraw the sampler from the sediment and proceed to Step 15.
7. If the drive hammer is selected, insert the tapered handle (drive head) of the drive hammer through the drive head.
8. Drive the sampler into the sediment to the desired depth.
9. Record the length of the tube that penetrated the sample material, and the number of blows required to obtain this depth.
10. Remove the drive hammer and fit the keyhole-like opening on the flat side of the hammer onto the drive head. In this position, the hammer serves as a handle for the sampler.
11. Rotate the sampler to shear off the core at the bottom.
12. Lower the sampler handle (hammer) until it just clears the two ear-like protrusions on the drive head, and rotate about 90°.
13. Slowly withdraw the sampler from the sediment. If the drivehead was used, pull the hammer upwards and dislodge the sampler from the sediment.

14. Carefully remove the coring device from the water.
15. Unscrew the nosecone and remove the eggshell check valve.
16. Slide the acetate core out of the sampler tube. Decant surface water, using care to retain the fine sediment fraction. If head space is present in the upper end, a hacksaw may be used to shear the acetate tube off at the sediment surface. The acetate core may then be capped at both ends. Indicate on the acetate tube the appropriate orientation of the sediment core using a waterproof marker. The sample may be used in this fashion, or the contents transferred to a sample or homogenization container.
17. Open the acetate tube and transfer the sediment to a stainless steel, plastic or other appropriate composition (e.g., Teflon) container. Ensure that non-dedicated containers have been adequately decontaminated. If necessary, continue to collect additional sediment until sufficient material has been secured to fulfill analytical requirements. Thoroughly homogenize and then transfer sediment to sample containers appropriate for the analyses requested. Samples for volatile organic analysis must be collected directly from the bucket before homogenization to minimize volatilization of contaminants.

## 8.0 CALCULATIONS

This section is not applicable to this SOP.

## 9.0 QUALITY ASSURANCE/ QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

## 10.0 DATA VALIDATION

This section is not applicable to this SOP.

## 11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA/OSHA and Corporate health and safety procedures.

More specifically, when sampling sediment from waterbodies, physical hazards must be identified and adequate precautions must be taken to ensure the safety of the sampling team. The team member collecting the sample should not get too close to the edge of the waterbody, where bank failure may cause loss of balance. To prevent this, the person performing the sampling should be on a lifeline, and be wearing adequate protective equipment. If sampling from a vessel is determined to be necessary, appropriate protective measures must be implemented.

## 12.0 REFERENCES

Mason, B.J., Preparation of Soil Sampling Protocol: Technique and Strategies. 1983 EPA-600/4-83-020.

Barth, D.S. and B.J. Mason, Soil Sampling Quality Assurance User's Guide. 1984 EPA-600/4-84-043.

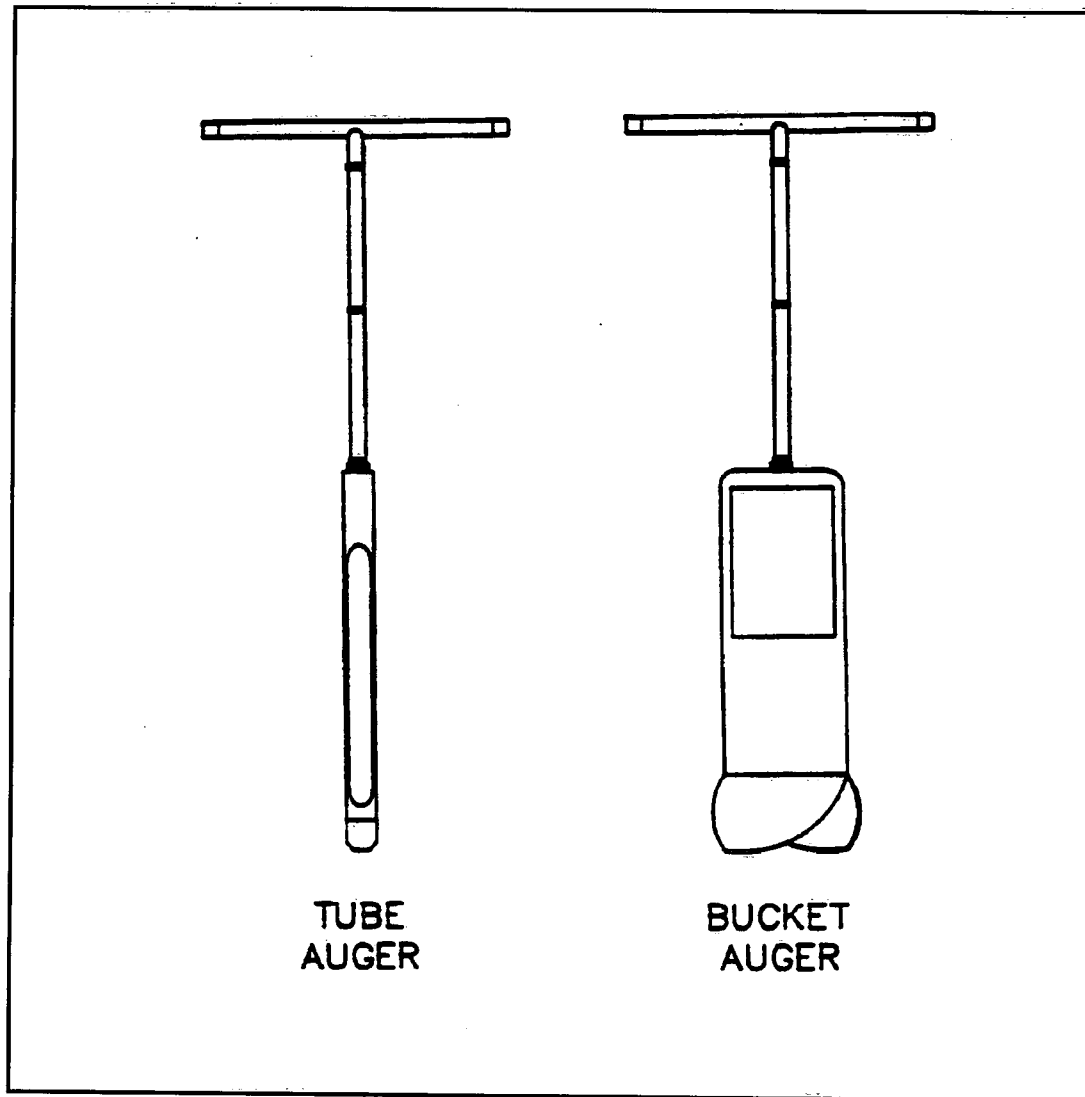
U.S. EPA. Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition. 1984 EPA-600/4-84-076.

de Vera, E.R., B.P. Simmons, R.D. Stephen, and D.L. Storm. Samplers and Sampling Procedures for Hazardous Waste Streams. 1980 EPA-600/2-80-018.

## APPENDIX A

### Figures

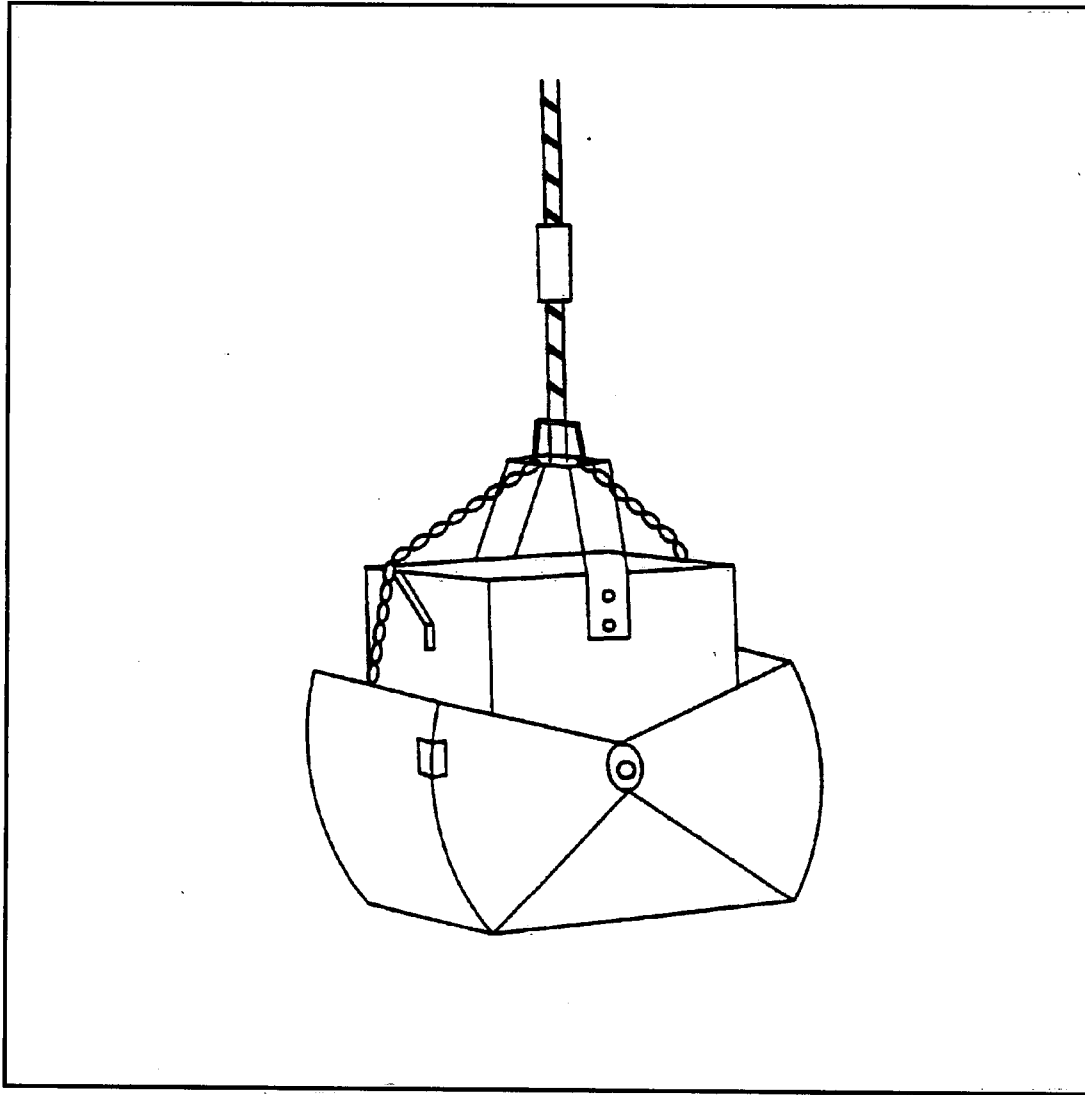
FIGURE 1. Sampling Auger



## APPENDIX A (Cont'd)

### Figures

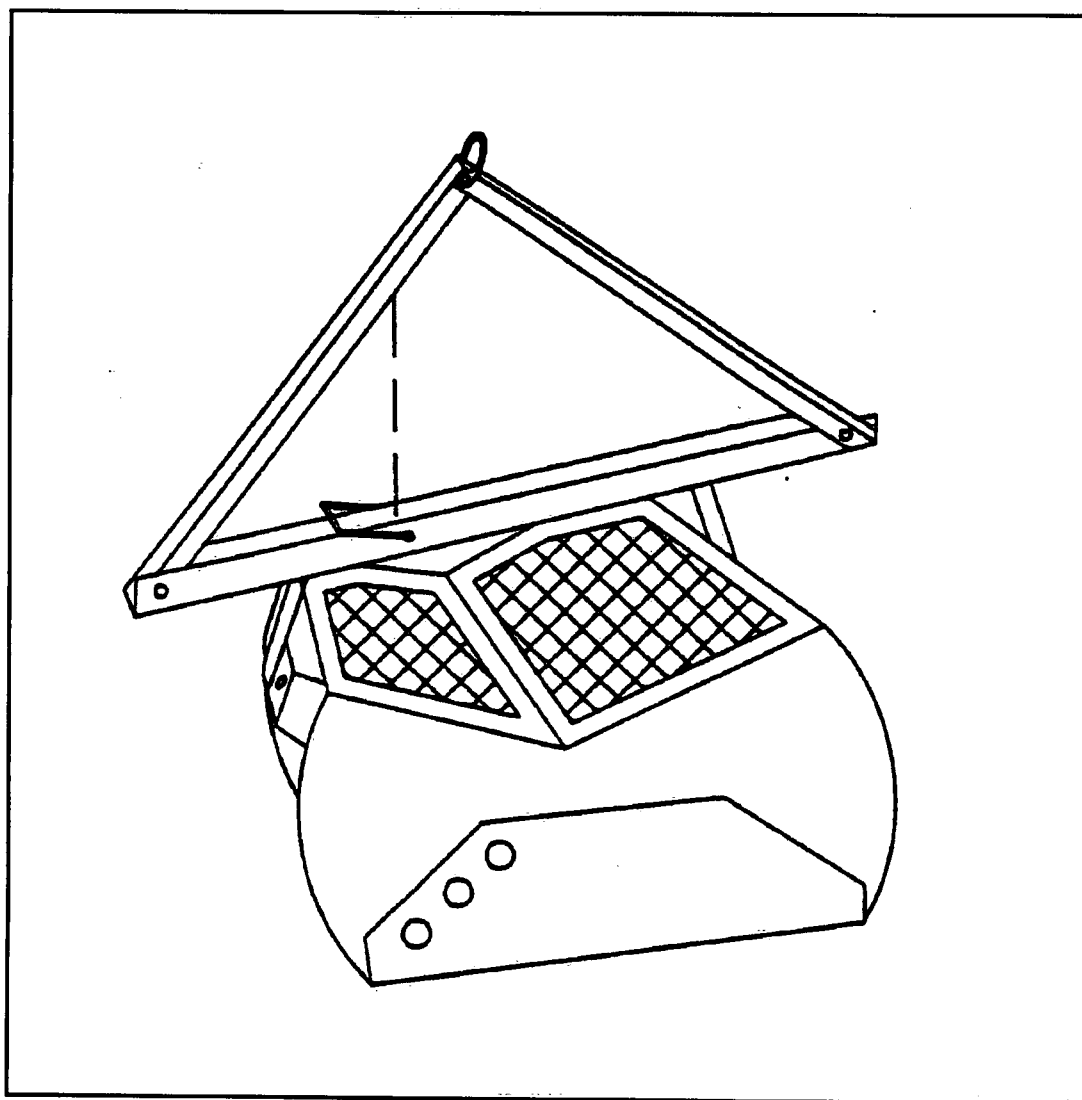
FIGURE 2. Ekman Dredge



## APPENDIX A (Cont'd)

### Figures

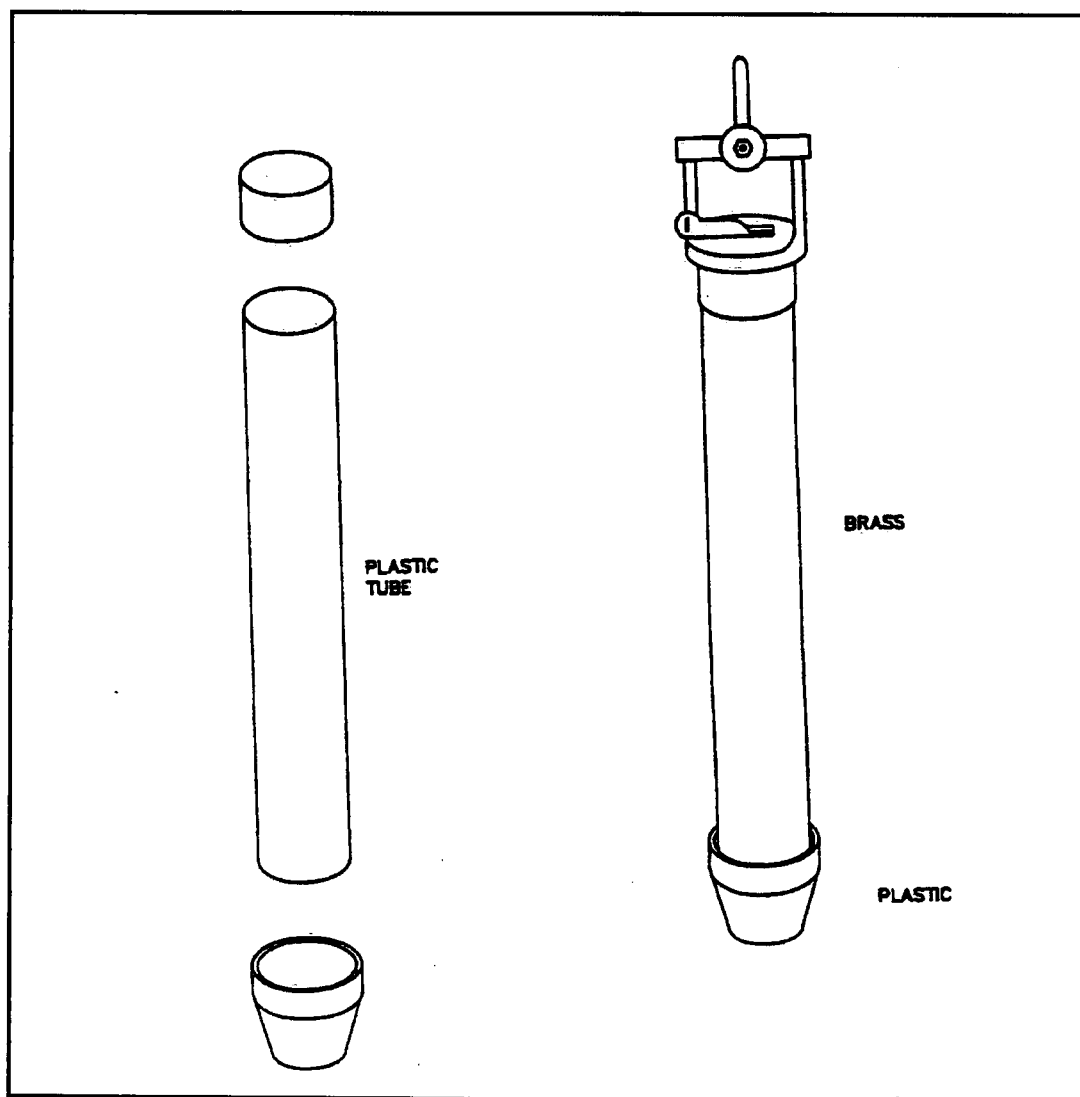
FIGURE 3. Ponar Dredge



## APPENDIX A (Cont'd)

### Figures

FIGURE 4. Sample Coring Device





## SURFACE WATER SAMPLING

SOP#: 2013  
DATE: 11/17/94  
REV. #: 0.0

### 1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) is applicable to the collection of representative liquid samples, both aqueous and non-aqueous from streams, rivers, lakes, ponds, lagoons, and surface impoundments. It includes samples collected from depth, as well as samples collected from the surface.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure or other procedure limitations. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (EPA) endorsement or recommendation for use.

### 2.0 METHOD SUMMARY

Sampling situations vary widely, therefore, no universal sampling procedure can be recommended. However, sampling of both aqueous and non-aqueous liquids from the above mentioned sources is generally accomplished through the use of one of the following samplers or techniques:

- C Kemmerer bottle
- C Bacon bomb sampler
- C Dip sampler
- C Direct method

These sampling techniques will allow for the collection of representative samples from the majority of surface waters and impoundments encountered.

### 3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Once samples have been collected, the following procedure should be followed:

1. Transfer the sample(s) into suitable, labeled sample containers.
2. Preserve the sample if appropriate, or use pre-preserved sample bottles. Do not overfill bottles if they are pre-preserved.
3. Cap the container, place in a ziploc plastic bag and cool to 4°C.
4. Record all pertinent data in the site logbook and on field data sheets.
5. Complete the Chain of Custody record.
6. Attach custody seals to cooler prior to shipment.
7. Decontaminate all sampling equipment prior to the collection of additional samples with that sampling device.

### 4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary interferences or potential problems with surface water sampling. These include cross contamination of samples and improper sample collection.



1. Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Refer to the Sampling Equipment Decontamination SOP.
2. Improper sample collection can involve using contaminated equipment, disturbance of the stream or impoundment substrate, and sampling in an obviously disturbed area.

Following proper decontamination procedures and minimizing disturbance of the sample site will eliminate these problems.

## 5.0 EQUIPMENT/APPARATUS

Equipment needed for collection of surface water samples may include (depending on technique chosen):

- C Kemmerer bottles
- C Bacon bomb sampler
- C Dip sampler
- C Line and messengers
- C Sample bottles/preservatives
- C Ziploc bags
- C Ice
- C Coolers
- C Chain of Custody records, custody seals
- C Field data sheets
- C Decontamination equipment
- C Maps/plot plan
- C Safety equipment
- C Compass
- C Tape measure
- C Survey stakes, flags, or buoys and anchors
- C Camera and film
- C Logbook/waterproof pen
- C Sample bottle labels

## 6.0 REAGENTS

Reagents will be utilized for preservation of samples and for decontamination of sampling equipment. The preservatives required are specified by the analysis to be performed.

## 7.0 PROCEDURES

### 7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed.
2. Obtain the necessary sampling and monitoring equipment.
3. Decontaminate or pre-clean equipment, and ensure that it is in working order.
4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.
5. Perform a general site survey prior to site entry, in accordance with the site specific Health and Safety Plan.
6. Use stakes, flagging, or buoys to identify and mark all sampling locations. If required the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. If collecting sediment samples, this procedure may disturb the bottom.

### 7.2 Representative Sampling Considerations

In order to collect a representative sample, the hydrology and morphometrics of a stream or impoundment should be determined prior to sampling. This will aid in determining the presence of phases or layers in lagoons, or impoundments, flow patterns in streams, and appropriate sample locations and depths.

Water quality data should be collected in impoundments, and to determine if stratification is present. Measurements of dissolved oxygen, pH, and temperature can indicate if strata exist which would effect analytical results. Measurements should be collected at one-meter intervals from the substrate to the surface using the appropriate instrument (i.e., a Hydrolab or equivalent).

Water quality measurements such as dissolved oxygen, pH, temperature, conductivity, and oxidation-reduction potential can assist in the interpretation of analytical data and the selection of sampling sites and depths when surface water samples are collected.

Generally, the deciding factors in the selection of a sampling device for sampling liquids in streams, rivers, lakes, ponds, lagoons, and surface impoundments are:

1. Will the sample be collected from shore or from a boat?
2. What is the desired depth at which you wish to collect the sample?
3. What is the overall depth and flow direction of river or stream?
4. What type of sample will be collected (i.e., water or lagoon liquids)?

#### 7.2.1 Sampler Composition

The appropriate sampling device must be of a proper composition. Selection of samplers constructed of glass, stainless steel, PVC or PTFE (Teflon) should be based upon the analyses to be performed.

### 7.3 Sample Collection

#### 7.3.1 Kemmerer Bottle

A Kemmerer bottle (Figure 1, Appendix A) may be used in most situations where site access is from a boat or structure such as a bridge or pier, and where samples at depth are required. Sampling procedures are as follows:

1. Use a properly decontaminated Kemmerer bottle. Set the sampling device so that the sampling end pieces (upper and lower stoppers) are pulled away from the sampling tube (body), allowing the substance to be sampled to pass through this tube.
2. Lower the pre-set sampling device to the predetermined depth. Avoid bottom disturbance.

3. When the Kemmerer bottle is at the required depth, send down the messenger, closing the sampling device.
4. Retrieve the sampler and discharge from the bottom drain the first 10-20 mL to clear any potential contamination of the valve. Transfer the sample to the appropriate sample container.

#### 7.3.2 Bacon Bomb Sampler

A bacon bomb sampler (Figure 2, Appendix A) may be used in situations similar to those outlined for the Kemmerer bottle. Sampling procedures are as follows:

1. Lower the bacon bomb sampler carefully to the desired depth, allowing the line for the trigger to remain slack at all times. When the desired depth is reached, pull the trigger line until taut. This will allow the sampler to fill.
2. Release the trigger line and retrieve the sampler.
3. Transfer the sample to the appropriate sample container by pulling up on the trigger.

#### 7.3.3 Dip Sampler

A dip sampler (Figure 3, Appendix A) is useful in situations where a sample is to be recovered from an outfall pipe or along a lagoon bank where direct access is limited. The long handle on such a device allows access from a discrete location. Sampling procedures are as follows:

1. Assemble the device in accordance with the manufacturer's instructions.
2. Extend the device to the sample location and collect the sample by dipping the sampler into the substance.
3. Retrieve the sampler and transfer the sample to the appropriate sample container.

### 7.3.4 Direct Method

For streams, rivers, lakes, and other surface waters, the direct method may be utilized to collect water samples from the surface directly into the sample bottle. This method is not to be used for sampling lagoons or other impoundments where contact with contaminants is a concern.

Using adequate protective clothing, access the sampling station by appropriate means. For shallow stream stations, collect the sample under the water surface while pointing the sample container upstream; the container must be upstream of the collector. Avoid disturbing the substrate. For lakes and other impoundments, collect the sample under the water surface avoiding surface debris and the boat wake.

When using the direct method, do not use pre-preserved sample bottles as the collection method may dilute the concentration of preservative necessary for proper sample preservation.

## 8.0 CALCULATIONS

This section is not applicable to this SOP.

## 9.0 QUALITY ASSURANCE/ QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following general QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation and they must be documented.

## 10.0 DATA VALIDATION

This section is not applicable to this SOP.

## 11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and corporate health and safety procedures.

More specifically, when sampling lagoons or surface impoundments containing known or suspected hazardous substances, adequate precautions must be taken to ensure the safety of sampling personnel. The sampling team member collecting the sample should not get too close to the edge of the impoundment, where bank failure may cause him/her to lose his/her balance. The person performing the sampling should be on a lifeline and be wearing adequate protective equipment. When conducting sampling from a boat in an impoundment or flowing waters, appropriate boating safety procedures should be followed.

## 12.0 REFERENCES

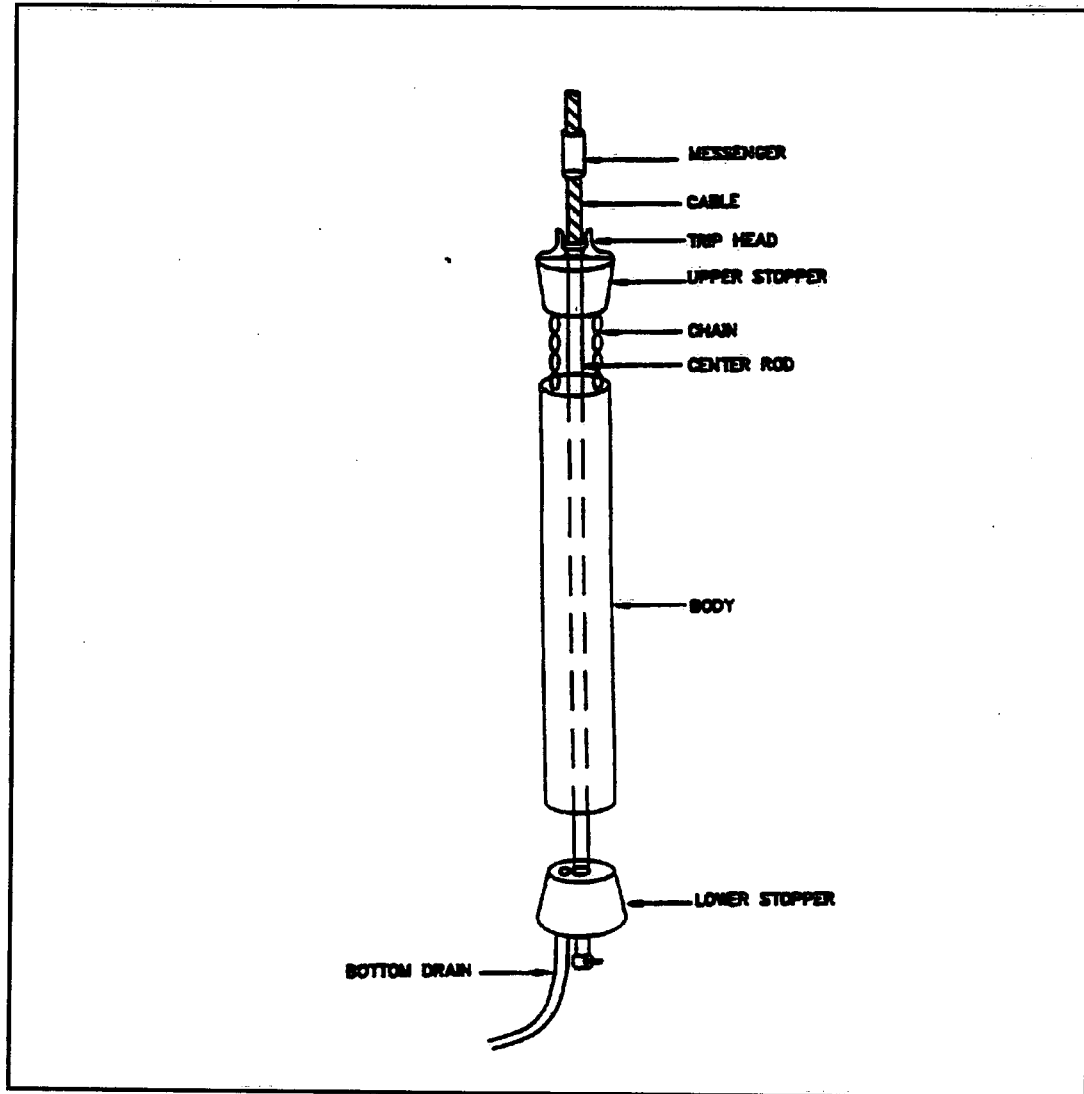
U.S. Geological Survey. 1977. National Handbook or Recommended Methods for Water Data Acquisition. Office of Water Data Coordination Reston, Virginia. (Chapter Updates available).

U.S. Environmental Protection Agency. 1984. Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition. EPA/600/4-84-076.

## APPENDIX A

### Figures

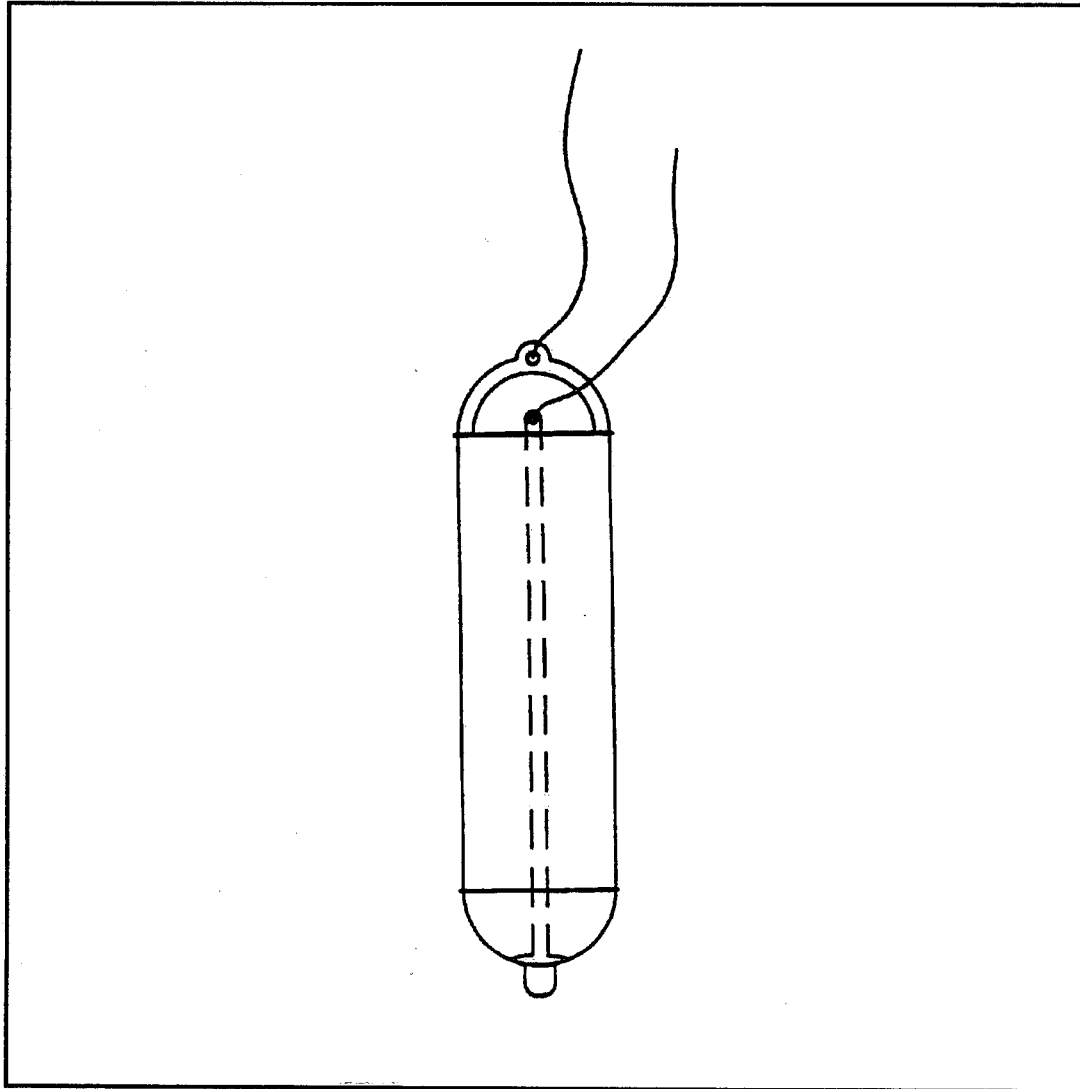
FIGURE 1. Kemmerer Bottle



## APPENDIX A (Cont'd)

### Figures

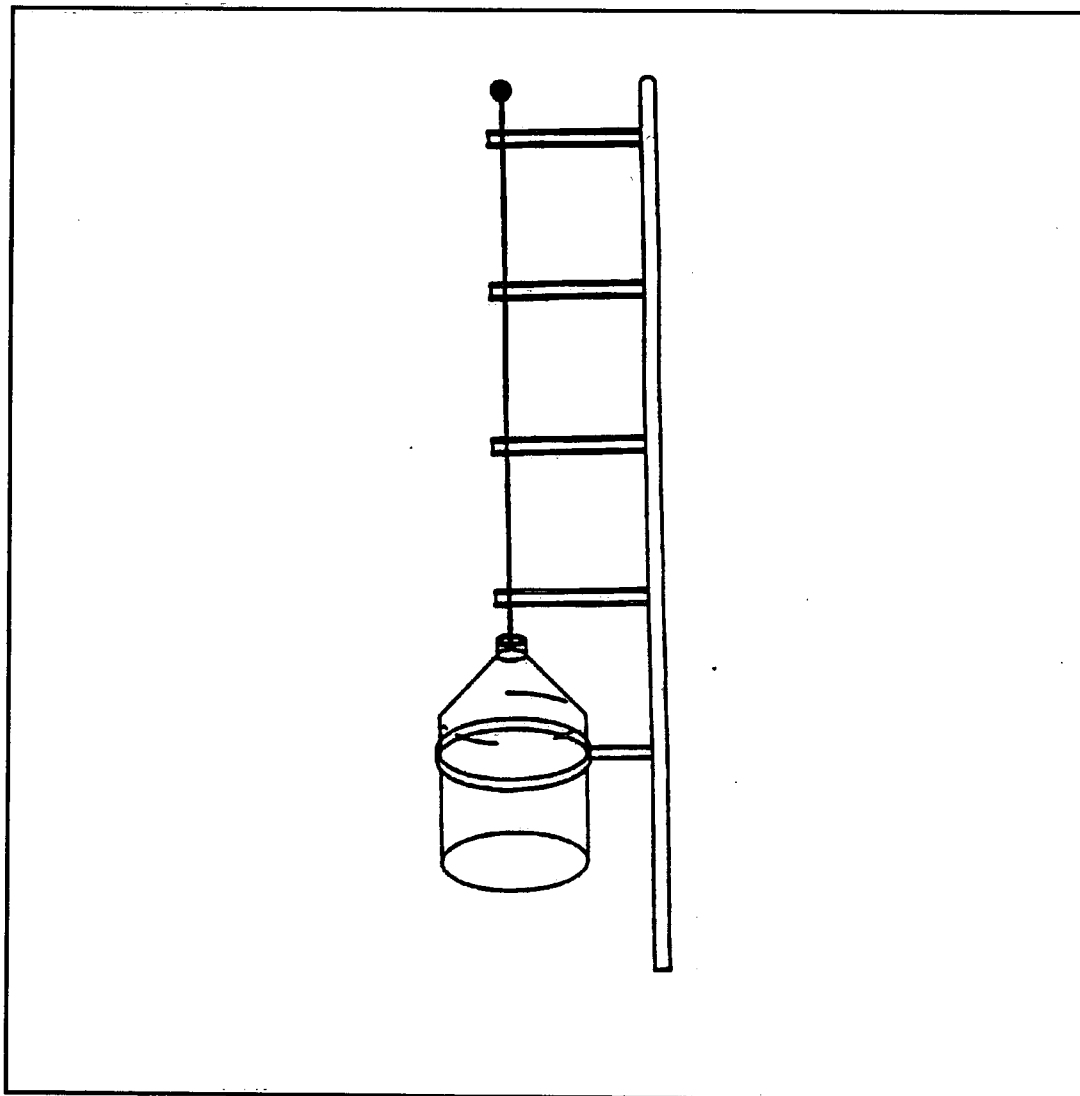
FIGURE 2. Bacon Bomb Sampler



## APPENDIX A (Cont'd)

### Figures

FIGURE 3. Dip Sampler





## SAMPLING EQUIPMENT DECONTAMINATION

SOP#: 2006  
DATE: 08/11/94  
REV. #: 0.0

### 1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide a description of the methods used for preventing, minimizing, or limiting cross-contamination of samples due to inappropriate or inadequate equipment decontamination and to provide general guidelines for developing decontamination procedures for sampling equipment to be used during hazardous waste operations as per 29 Code of Federal Regulations (CFR) 1910.120. This SOP does not address personnel decontamination.

These are standard (i.e. typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitation, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

### 2.0 METHOD SUMMARY

Removing or neutralizing contaminants from equipment minimizes the likelihood of sample cross contamination, reduces or eliminates transfer of contaminants to clean areas, and prevents the mixing of incompatible substances.

Gross contamination can be removed by physical decontamination procedures. These abrasive and non-abrasive methods include the use of brushes, air and wet blasting, and high and low pressure water cleaning.

The first step, a soap and water wash, removes all visible particulate matter and residual oils and grease. This may be preceded by a steam or high pressure

water wash to facilitate residuals removal. The second step involves a tap water rinse and a distilled/deionized water rinse to remove the detergent. An acid rinse provides a low pH media for trace metals removal and is included in the decontamination process if metal samples are to be collected. It is followed by another distilled/deionized water rinse. If sample analysis does not include metals, the acid rinse step can be omitted. Next, a high purity solvent rinse is performed for trace organics removal if organics are a concern at the site. Typical solvents used for removal of organic contaminants include acetone, hexane, or water. Acetone is typically chosen because it is an excellent solvent, miscible in water, and not a target analyte on the Priority Pollutant List. If acetone is known to be a contaminant of concern at a given site or if Target Compound List analysis (which includes acetone) is to be performed, another solvent may be substituted. The solvent must be allowed to evaporate completely and then a final distilled/deionized water rinse is performed. This rinse removes any residual traces of the solvent.

The decontamination procedure described above may be summarized as follows:

1. Physical removal
2. Non-phosphate detergent wash
3. Tap water rinse
4. Distilled/deionized water rinse
5. 10% nitric acid rinse
6. Distilled/deionized water rinse
7. Solvent rinse (pesticide grade)
8. Air dry
9. Distilled/deionized water rinse

If a particular contaminant fraction is not present at the site, the nine (9) step decontamination procedure specified above may be modified for site specificity. For example, the nitric acid rinse may be eliminated if metals are not of concern at a site. Similarly, the solvent rinse may be eliminated if organics are not of

concern at a site. Modifications to the standard procedure should be documented in the site specific work plan or subsequent report.

### **3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE**

The amount of sample to be collected and the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix being sampled and the parameter(s) of interest.

More specifically, sample collection and analysis of decontamination waste may be required before beginning proper disposal of decontamination liquids and solids generated at a site. This should be determined prior to initiation of site activities.

### **4.0 INTERFERENCES AND POTENTIAL PROBLEMS**

- C The use of distilled/deionized water commonly available from commercial vendors may be acceptable for decontamination of sampling equipment provided that it has been verified by laboratory analysis to be analyte free (specifically for the contaminants of concern).
- C The use of an untreated potable water supply is not an acceptable substitute for tap water. Tap water may be used from any municipal or industrial water treatment system.
- C If acids or solvents are utilized in decontamination they raise health and safety, and waste disposal concerns.
- C Damage can be incurred by acid and solvent washing of complex and sophisticated sampling equipment.

### **5.0 EQUIPMENT/APPARATUS**

Decontamination equipment, materials, and supplies are generally selected based on availability. Other considerations include the ease of decontaminating or disposing of the equipment. Most equipment and supplies can be easily procured. For example, soft-

bristle scrub brushes or long-handled bottle brushes can be used to remove contaminants. Large galvanized wash tubs, stock tanks, or buckets can hold wash and rinse solutions. Children's wading pools can also be used. Large plastic garbage cans or other similar containers lined with plastic bags can help segregate contaminated equipment. Contaminated liquid can be stored temporarily in metal or plastic cans or drums.

The following standard materials and equipment are recommended for decontamination activities:

#### **5.1 Decontamination Solutions**

- C Non-phosphate detergent
- C Selected solvents (acetone, hexane, nitric acid, etc.)
- C Tap water
- C Distilled or deionized water

#### **5.2 Decontamination Tools/Supplies**

- C Long and short handled brushes
- C Bottle brushes
- C Drop cloth/plastic sheeting
- C Paper towels
- C Plastic or galvanized tubs or buckets
- C Pressurized sprayers (H<sub>2</sub>O)
- C Solvent sprayers
- C Aluminum foil

#### **5.3 Health and Safety Equipment**

Appropriate personal protective equipment (i.e., safety glasses or splash shield, appropriate gloves, aprons or coveralls, respirator, emergency eye wash)

#### **5.4 Waste Disposal**

- C Trash bags
- C Trash containers
- C 55-gallon drums
- C Metal/plastic buckets/containers for storage and disposal of decontamination solutions

### **6.0 REAGENTS**

There are no reagents used in this procedure aside from the actual decontamination solutions. Table 1 (Appendix A) lists solvent rinses which may be required for elimination of particular chemicals. In



general, the following solvents are typically utilized for decontamination purposes:

- C 10% nitric acid is typically used for inorganic compounds such as metals. An acid rinse may not be required if inorganics are not a contaminant of concern.
- C Acetone (pesticide grade)<sup>(1)</sup>
- C Hexane (pesticide grade)<sup>(1)</sup>
- C Methanol<sup>(1)</sup>

<sup>(1)</sup> - Only if sample is to be analyzed for organics.

## 7.0 PROCEDURES

As part of the health and safety plan, a decontamination plan should be developed and reviewed. The decontamination line should be set up before any personnel or equipment enter the areas of potential exposure. The equipment decontamination plan should include:

- C The number, location, and layout of decontamination stations.
- C Decontamination equipment needed.
- C Appropriate decontamination methods.
- C Methods for disposal of contaminated clothing, equipment, and solutions.
- C Procedures can be established to minimize the potential for contamination. This may include: (1) work practices that minimize contact with potential contaminants; (2) using remote sampling techniques; (3) covering monitoring and sampling equipment with plastic, aluminum foil, or other protective material; (4) watering down dusty areas; (5) avoiding laying down equipment in areas of obvious contamination; and (6) use of disposable sampling equipment.

### 7.1 Decontamination Methods

All samples and equipment leaving the contaminated area of a site must be decontaminated to remove any contamination that may have adhered to equipment. Various decontamination methods will remove contaminants by: (1) flushing or other physical action, or (2) chemical complexing to inactivate

contaminants by neutralization, chemical reaction, disinfection, or sterilization.

Physical decontamination techniques can be grouped into two categories: abrasive methods and non-abrasive methods, as follows:

#### 7.1.1 Abrasive Cleaning Methods

Abrasive cleaning methods work by rubbing and wearing away the top layer of the surface containing the contaminant. The mechanical abrasive cleaning methods are most commonly used at hazardous waste sites. The following abrasive methods are available:

##### Mechanical

Mechanical methods of decontamination include using metal or nylon brushes. The amount and type of contaminants removed will vary with the hardness of bristles, length of time brushed, degree of brush contact, degree of contamination, nature of the surface being cleaned, and degree of contaminant adherence to the surface.

##### Air Blasting

Air blasting equipment uses compressed air to force abrasive material through a nozzle at high velocities. The distance between nozzle and surface cleaned, air pressure, time of application, and angle at which the abrasive strikes the surface will dictate cleaning efficiency. Disadvantages of this method are the inability to control the amount of material removed and the large amount of waste generated.

##### Wet Blasting

Wet blast cleaning involves use of a suspended fine abrasive. The abrasive/water mixture is delivered by compressed air to the contaminated area. By using a very fine abrasive, the amount of materials removed can be carefully controlled.

#### 7.1.2 Non-Abrasive Cleaning Methods

Non-abrasive cleaning methods work by forcing the contaminant off a surface with pressure. In general, the equipment surface is not removed using non-abrasive methods.

### Low-Pressure Water

This method consists of a container which is filled with water. The user pumps air out of the container to create a vacuum. A slender nozzle and hose allow the user to spray in hard-to-reach places.

### High-Pressure Water

This method consists of a high-pressure pump, an operator controlled directional nozzle, and a high-pressure hose. Operating pressure usually ranges from 340 to 680 atmospheres (atm) and flow rates usually range from 20 to 140 liters per minute.

### Ultra-High-Pressure Water

This system produces a water jet that is pressured from 1,000 to 4,000 atmospheres. This ultra-high-pressure spray can remove tightly-adhered surface films. The water velocity ranges from 500 meters/second (m/s) (1,000 atm) to 900 m/s (4,000 atm). Additives can be used to enhance the cleaning action.

### Rinsing

Contaminants are removed by rinsing through dilution, physical attraction, and solubilization.

### Damp Cloth Removal

In some instances, due to sensitive, non-waterproof equipment or due to the unlikelihood of equipment being contaminated, it is not necessary to conduct an extensive decontamination procedure. For example, air sampling pumps hooked on a fence, placed on a drum, or wrapped in plastic bags are not likely to become heavily contaminated. A damp cloth should be used to wipe off contaminants which may have adhered to equipment through airborne contaminants or from surfaces upon which the equipment was set.

### Disinfection/Sterilization

Disinfectants are a practical means of inactivating infectious agents. Unfortunately, standard sterilization methods are impractical for large equipment. This method of decontamination is typically performed off-site.

## **7.2 Field Sampling Equipment Decontamination Procedures**

The decontamination line is setup so that the first station is used to clean the most contaminated item. It progresses to the last station where the least contaminated item is cleaned. The spread of contaminants is further reduced by separating each decontamination station by a minimum of three (3) feet. Ideally, the contamination should decrease as the equipment progresses from one station to another farther along in the line.

A site is typically divided up into the following boundaries: Hot Zone or Exclusion Zone (EZ), the Contamination Reduction Zone (CRZ), and the Support or Safe Zone (SZ). The decontamination line should be setup in the Contamination Reduction Corridor (CRC) which is in the CRZ. Figure 1 (Appendix B) shows a typical contaminant reduction zone layout. The CRC controls access into and out of the exclusion zone and confines decontamination activities to a limited area. The CRC boundaries should be conspicuously marked. The far end is the hotline, the boundary between the exclusion zone and the contamination reduction zone. The size of the decontamination corridor depends on the number of stations in the decontamination process, overall dimensions of the work zones, and amount of space available at the site. Whenever possible, it should be a straight line.

Anyone in the CRC should be wearing the level of protection designated for the decontamination crew. Another corridor may be required for the entry and exit of heavy equipment. Sampling and monitoring equipment and sampling supplies are all maintained outside of the CRC. Personnel don their equipment away from the CRC and enter the exclusion zone through a separate access control point at the hotline. One person (or more) dedicated to decontaminating equipment is recommended.

### **7.2.1 Decontamination Setup**

Starting with the most contaminated station, the decontamination setup should be as follows:

#### Station 1: Segregate Equipment Drop

Place plastic sheeting on the ground (Figure 2, Appendix B). Size will depend on amount of

equipment to be decontaminated. Provide containers lined with plastic if equipment is to be segregated. Segregation may be required if sensitive equipment or mildly contaminated equipment is used at the same time as equipment which is likely to be heavily contaminated.

#### Station 2: Physical Removal With A High-Pressure Washer (Optional)

As indicated in 7.1.2, a high-pressure wash may be required for compounds which are difficult to remove by washing with brushes. The elevated temperature of the water from the high-pressure washers is excellent at removing greasy/oily compounds. High pressure washers require water and electricity.

A decontamination pad may be required for the high-pressure wash area. An example of a wash pad may consist of an approximately 1 1/2 foot-deep basin lined with plastic sheeting and sloped to a sump at one corner. A layer of sand can be placed over the plastic and the basin is filled with gravel or shell. The sump is also lined with visqueen and a barrel is placed in the hole to prevent collapse. A sump pump is used to remove the water from the sump for transfer into a drum.

Typically heavy machinery is decontaminated at the end of the day unless site sampling requires that the machinery be decontaminated frequently. A separate decontamination pad may be required for heavy equipment.

#### Station 3: Physical Removal With Brushes And A Wash Basin

Prior to setting up Station 3, place plastic sheeting on the ground to cover areas under Station 3 through Station 10.

Fill a wash basin, a large bucket, or child's swimming pool with non-phosphate detergent and tap water. Several bottle and bristle brushes to physically remove contamination should be dedicated to this station. Approximately 10 - 50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

#### Station 4: Water Basin

Fill a wash basin, a large bucket, or child's swimming

pool with tap water. Several bottle and bristle brushes should be dedicated to this station. Approximately 10-50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

#### Station 5: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to contain the water during the rinsing process. Approximately 10-20 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

#### Station 6: Nitric Acid Sprayers

Fill a spray bottle with 10% nitric acid. An acid rinse may not be required if inorganics are not a contaminant of concern. The amount of acid will depend on the amount of equipment to be decontaminated. Provide a 5-gallon bucket or basin to collect acid during the rinsing process.

#### Station 7: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

#### Station 8: Organic Solvent Sprayers

Fill a spray bottle with an organic solvent. After each solvent rinse, the equipment should be rinsed with distilled/deionized water and air dried. Amount of solvent will depend on the amount of equipment to decontaminate. Provide a 5-gallon bucket or basin to collect the solvent during the rinsing process.

Solvent rinses may not be required unless organics are a contaminant of concern, and may be eliminated from the station sequence.

#### Station 9: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

#### Station 10: Clean Equipment Drop

Lay a clean piece of plastic sheeting over the bottom

plastic layer. This will allow easy removal of the plastic in the event that it becomes dirty. Provide aluminum foil, plastic, or other protective material to wrap clean equipment.

## 7.2.2 Decontamination Procedures

### Station 1: Segregate Equipment Drop

Deposit equipment used on-site (i.e., tools, sampling devices and containers, monitoring instruments radios, clipboards, etc.) on the plastic drop cloth/sheet or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross contamination. Loose leaf sampling data sheets or maps can be placed in plastic zip lock bags if contamination is evident.

### Station 2: Physical Removal With A High-Pressure Washer (Optional)

Use high pressure wash on grossly contaminated equipment. Do not use high- pressure wash on sensitive or non-waterproof equipment.

### Station 3: Physical Removal With Brushes And A Wash Basin

Scrub equipment with soap and water using bottle and bristle brushes. Only sensitive equipment (i.e., radios, air monitoring and sampling equipment) which is waterproof should be washed. Equipment which is not waterproof should have plastic bags removed and wiped down with a damp cloth. Acids and organic rinses may also ruin sensitive equipment. Consult the manufacturers for recommended decontamination solutions.

### Station 4: Equipment Rinse

Wash soap off of equipment with water by immersing the equipment in the water while brushing. Repeat as many times as necessary.

### Station 5: Low-Pressure Rinse

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

### Station 6: Nitric Acid Sprayers ( required only if metals are a contaminant of concern)

Using a spray bottle rinse sampling equipment with nitric acid. Begin spraying (inside and outside) at one end of the equipment allowing the acid to drip to the other end into a 5-gallon bucket. A rinsate blank may be required at this station. Refer to Section 9.

### Station 7: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

### Station 8: Organic Solvent Sprayers

Rinse sampling equipment with a solvent. Begin spraying (inside and outside) at one end of the equipment allowing the solvent to drip to the other end into a 5-gallon bucket. Allow the solvent to evaporate from the equipment before going to the next station. A QC rinsate sample may be required at this station.

### Station 9: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure washer.

### Station 10: Clean Equipment Drop

Lay clean equipment on plastic sheeting. Once air dried, wrap sampling equipment with aluminum foil, plastic, or other protective material.

## 7.2.3 Post Decontamination Procedures

1. Collect high-pressure pad and heavy equipment decontamination area liquid and waste and store in appropriate drum or container. A sump pump can aid in the collection process. Refer to the Department of Transportation (DOT) requirements for appropriate containers based on the contaminant of concern.
2. Collect high-pressure pad and heavy equipment decontamination area solid waste and store in appropriate drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.
3. Empty soap and water liquid wastes from basins and buckets and store in appropriate

drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

4. Empty acid rinse waste and place in appropriate container or neutralize with a base and place in appropriate drum. pH paper or an equivalent pH test is required for neutralization. Consult DOT requirements for appropriate drum for acid rinse waste.
5. Empty solvent rinse sprayer and solvent waste into an appropriate container. Consult DOT requirements for appropriate drum for solvent rinse waste.
6. Using low-pressure sprayers, rinse basins, and brushes. Place liquid generated from this process into the wash water rinse container.
7. Empty low-pressure sprayer water onto the ground.
8. Place all solid waste materials generated from the decontamination area (i.e., gloves and plastic sheeting, etc.) in an approved DOT drum. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.
9. Write appropriate labels for waste and make arrangements for disposal. Consult DOT regulations for the appropriate label for each drum generated from the decontamination process.

## **8.0 CALCULATIONS**

This section is not applicable to this SOP.

## **9.0 QUALITY ASSURANCE/ QUALITY CONTROL**

A rinsate blank is one specific type of quality control sample associated with the field decontamination process. This sample will provide information on the effectiveness of the decontamination process employed in the field.

Rinsate blanks are samples obtained by running analyte free water over decontaminated sampling

equipment to test for residual contamination. The blank water is collected in sample containers for handling, shipment, and analysis. These samples are treated identical to samples collected that day. A rinsate blank is used to assess cross contamination brought about by improper decontamination procedures. Where dedicated sampling equipment is not utilized, collect one rinsate blank per day per type of sampling device samples to meet QA2 and QA3 objectives.

If sampling equipment requires the use of plastic tubing it should be disposed of as contaminated and replaced with clean tubing before additional sampling occurs.

## **10.0 DATA VALIDATION**

Results of quality control samples will be evaluated for contamination. This information will be utilized to qualify the environmental sample results in accordance with the project's data quality objectives.

## **11.0 HEALTH AND SAFETY**

When working with potentially hazardous materials, follow OSHA, U.S. EPA, corporate, and other applicable health and safety procedures.

Decontamination can pose hazards under certain circumstances. Hazardous substances may be incompatible with decontamination materials. For example, the decontamination solution may react with contaminants to produce heat, explosion, or toxic products. Also, vapors from decontamination solutions may pose a direct health hazard to workers by inhalation, contact, fire, or explosion.

The decontamination solutions must be determined to be acceptable before use. Decontamination materials may degrade protective clothing or equipment; some solvents can permeate protective clothing. If decontamination materials do pose a health hazard, measures should be taken to protect personnel or substitutions should be made to eliminate the hazard. The choice of respiratory protection based on contaminants of concern from the site may not be appropriate for solvents used in the decontamination process.

Safety considerations should be addressed when using abrasive and non-abrasive decontamination

equipment. Maximum air pressure produced by abrasive equipment could cause physical injury. Displaced material requires control mechanisms.

Material generated from decontamination activities requires proper handling, storage, and disposal. Personal Protective Equipment may be required for these activities.

Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard (i.e., acetone, alcohol, and trisodiumphosphate).

In some jurisdictions, phosphate containing detergents (i.e., TSP) are banned.

## 12.0 REFERENCES

Field Sampling Procedures Manual, New Jersey Department of Environmental Protection, February, 1988.

A Compendium of Superfund Field Operations Methods, EPA 540/p-87/001.

Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, USEPA Region IV, April 1, 1986.

Guidelines for the Selection of Chemical Protective Clothing, Volume 1, Third Edition, American Conference of Governmental Industrial Hygienists, Inc., February, 1987.

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, October, 1985.

## APPENDIX A

Table

Table 1. Soluble Contaminants and Recommended Solvent Rinse

TABLE 1 Soluble Contaminants and Recommended Solvent Rinse		
SOLVENT <sup>(1)</sup>	EXAMPLES OF SOLVENTS	SOLUBLE CONTAMINANTS
Water	Deionized water Tap water	Low-chain hydrocarbons Inorganic compounds Salts Some organic acids and other polar compounds
Dilute Acids	Nitric acid Acetic acid Boric acid	Basic (caustic) compounds (e.g., amines and hydrazines)
Dilute Bases	Sodium bicarbonate (e.g., soap detergent)	Acidic compounds Phenol Thiols Some nitro and sulfonic compounds
Organic Solvents <sup>(2)</sup>	Alcohols Ethers Ketones Aromatics Straight chain alkalines (e.g., hexane) Common petroleum products (e.g., fuel, oil, kerosene)	Nonpolar compounds (e.g., some organic compounds)
Organic Solvent <sup>(2)</sup>	Hexane	PCBs

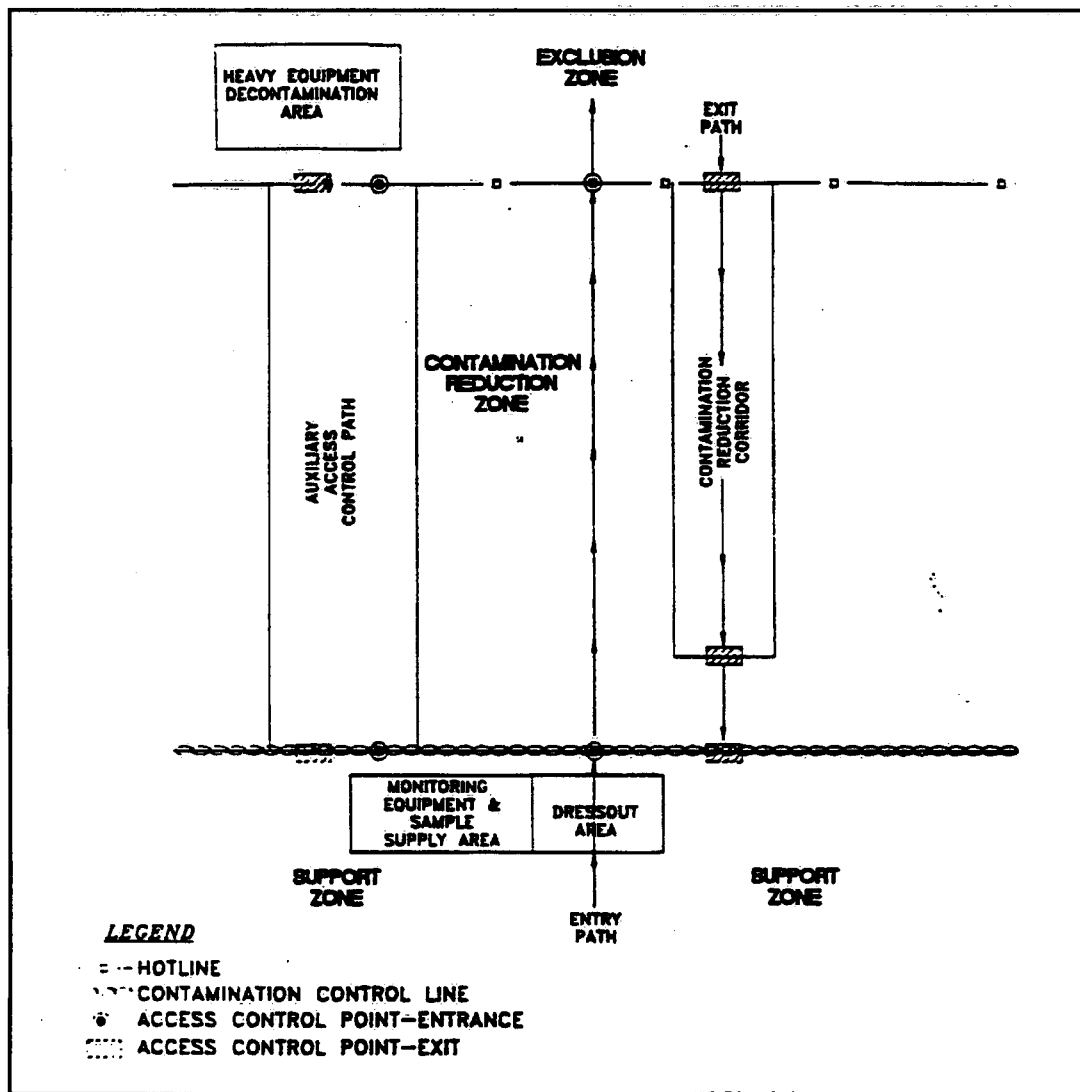
<sup>(1)</sup> - Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard

<sup>(2)</sup> - WARNING: Some organic solvents can permeate and/or degrade the protective clothing

## APPENDIX B

### Figures

Figure 1. Contamination Reduction Zone Layout





## APPENDIX B (Cont'd.)

### Figures

Figure 2. Decontamination Layout

